



**ENGINEERING EVALUATION/
COST ANALYSIS (EE/CA)
FOR
REMOVAL ACTIONS
BAYONNE BARREL & DRUM SITE
NEWARK, NEW JERSEY**

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SECTION 1

INTRODUCTION

This Engineering Evaluation/Cost Analysis (EE/CA) contains a comparative evaluation of removal alternatives for removing contaminated soils and equipment present at the Bayonne Barrel and Drum (BB&D) Company in Newark, Essex County, New Jersey. This site has undergone soil and groundwater investigations and waste characterization activities by USEPA, NJ Turnpike Authority, and private parties. The results of those activities are described in several reports (Raviv, July 1986; Berger, December 1986 and December 1986a; Blasland, March 1997). In addition, reports covering an adjacent property, the Former Newark Drive-In Property, provide information on BB&D (Berger, September, 1986; Wehran, October 1988).

Section 104 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA, or Superfund) and the Superfund Amendments and Reauthorization Act of 1986 (SARA) provides that removal actions are part of the response process and are often the first response to a release or threatened release. A removal action is considered appropriate when hazardous substances, pollutants, or contaminants in storage containers, such as drums or barrels, pose a threat of release. Prior to performing a non-time-critical removal action (which means a removal action for a site or sites that has a planning period of 6 months or more), the National Oil and Hazardous Substances Contingency Plan (NCP) requires the lead agency to conduct an EE/CA.

The EE/CA is a brief analysis of removal alternatives for a site or sites, prepared to document the removal action alternative evaluation and selection process. Submittal of this document will fulfill the requirements of the National Environmental Policy Act of 1969 (NEPA) for non-time-critical actions and the requirements defined by CERCLA, SARA, the NCP, and the Superfund Removal Procedures. Non-time-critical removal actions are defined by the U.S. Environmental Protection Agency (EPA) as actions that may be delayed for 6 months or more before on-site cleanup is initiated (i.e., 6-month planning period). This EE/CA has been prepared in accordance with the "Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA" (EPA Office of Solid Waste Emergency Response (OSWER), August 1993).

This EE/CA has been prepared by Roy F. Weston, Inc. (WESTON®) under contract to the United States Environmental Protection Agency as part of the Superfund Technical Assessment and Response Team (START) contract.

1.1 **OBJECTIVE AND GOALS**

The objective of this document is to evaluate removal alternatives for the BB&D site. Individual goals of this EE/CA are to: 1) satisfy environmental review and public relations requirements for removal actions; and 2) provide a framework for evaluating and selecting alternative technologies. The following information is presented within this EE/CA:

- An overall and specific site description, including summaries of previous studies and analytical data.
- Identification of the removal action objectives for the site.
- Identification of removal actions and technologies, and associated costs.

The removal actions and technologies will be compared on the basis of effectiveness, implementability, and cost to provide a framework for selecting the appropriate alternative. For the purposes of this document, removal actions are defined as the removal, containment or treatment of contamination to reduce the likelihood of human exposure. This EE/CA does not address groundwater, nor does it develop chemical-specific remedial action objectives, which would require a risk assessment.

SECTION 2

SITE CHARACTERIZATION

2.1 FACILITY HISTORY

The Bayonne Barrel and Drum (BB&D) Company operated a drum washing facility. Site activities included cleaning and reconditioning of drums using caustic solutions and incineration. Large quantities of drums (over 40,000) were stockpiled on the site. Both open head and closed head drums were processed. The site was developed as early as 1934. (Berger, Dec. 1986a). The site was also used as a solid waste landfill. In 1934, a small portion of the landfill is visible in aerial photos in the northwestern portion of the site. By 1947, the landfill area had greatly expanded, encompassing most of the southern portion of the property. (Berger Sept. 1986, Blasland, March 1997). A lagoon is present in 1947 and 1951 on the east side of the site, but removed in 1959. Tanks were present in 1985, also on the east side, and there was evidence of industrial waste disposal in 1959 and 1985. (Berger, Sept. 1986; Berger, December 1986a; BB&L, March 1997).

In the early 1980's, the site shut down and the owners filed for bankruptcy. U.S. EPA conducted site assessments of the property in 1984, 1988, and 1991, and in 1993 removed ignitable materials in abandoned trailers from the site. Additional removal actions, including tanks and approximately 45,000 drums, were conducted by U.S. EPA in 1994, following a fire at the site. At present, there are six ash piles, one above-ground wastewater treatment tank, and four shallow underground tanks (which have been emptied) on the site. Removal of the tanks is included in this EE/CA. U.S. EPA has committed to removing the ash piles, and they are therefore not addressed in this EE/CA. The primary focus of this EE/CA is on the remaining site contamination, which consists primarily of contaminated soil, both surface and subsurface.

2.2 INSTALLATION DESCRIPTION

The subject property is located at 150 Raymond Boulevard in Newark, Essex County, New Jersey (See Figure 2-1). It is situated between the New Jersey Turnpike (to the east) and the down ramp to Raymond Boulevard from New Jersey State Highway Routes Nos. 1 and 9 (to the north and west). The former Newark Drive-In is located adjacent to the property on the south (see Figure 2-2). The former drive-in has since been redeveloped and is presently a multi-screen indoor movie theater. The surrounding land use is industrial/commercial. The site consists of approximately 15 acres, and consists of predominantly open space on the south side and buildings on the north side. Three gas pipelines transect the site. According to Public Service Electric and Gas Company drawings, these may be within 4 feet of ground surface in some locations.

2.2.1 Local Topography at BB&D

The site is located in the old flood plain of the Passaic River (Berger, Dec 1986). The topography is relatively flat with a slight downward slope to the northeast (toward the river). Property elevations range from approximately 5 to 20 feet above sea level and slopes downward slightly to the northeast. The storm water sewer system empties into the Passaic River. There is no surface water body on site; a man-made lagoon and the Harrison ditch were previously located on the northeastern part of the property which was acquired by the NJ Turnpike Authority during an expansion of the NJ Turnpike in 1986.

2.2.2 Local Hydrogeology at BB&D

The following description of site geology is paraphrased from the characterization report prepared by Dan Raviv Associates, Inc. (Raviv, April 1986). Ground surface of the site is approximately ten feet above sea level and slopes downward slightly to the northeast. It is underlain by Pleistocene drift, which fills a buried valley cut into the Brunswick Formation. The Passaic River runs a loop, north of the site, and eventually joins the Hackensack River where it opens into Newark Bay. The River is within a one mile radius of the site. Boring log data, accumulated

during field investigations, indicate that there is a black coal-cinder type fill found from the surface down to an average depth of ten feet. The fill is underlain by a medium to a coarse grained, well sorted sand that ranges in color from brown to red-brown to dark maroon-brown. Observations of the lithology at depth were made while drilling well borings. The fill is underlain by a medium to coarse sand that lies within a depth interval of ten to forty feet. The material observed from forty to fifty feet below surface consists of a dark red-brown, uniform, coarse silt. Below fifty feet, observations of cuttings indicated a gradational zone downward into more consolidated material. Once drilling proceeded beyond fifty feet, small fragments of dark red shale were observed. Drilling continued to a depth of fifty-three feet to confirm these observations. These findings are interpreted as a vertical gradation into the upper zone of weathered Brunswick Shale Formation.

2.3 SUMMARY OF PREVIOUS INVESTIGATIONS AND AVAILABLE ANALYTICAL DATA

Previous investigations have been conducted at the BB&D site by EPA, NJ Turnpike Authority, and private parties. These are summarized as follows:

2.3.1 Investigation by Dan Raviv Associates, Inc. (1986)

In compliance with a Consent Agreement between BB&D and the U.S. EPA, Dan Raviv Associates, Inc., conducted soil and groundwater characterization during four field investigations from January 1985 to January 1986. Both organic and inorganic contaminants were found throughout the site. Total petroleum hydrocarbons (TPHs) were widespread, with highest concentrations generally nearer to surface. However, a TPH level of over 20000 ppm was measured at the 5-7 feet interval in the furnace area, and at over 5000 ppm in the 9-11 foot interval in the incoming drum storage area. Many TPH concentrations exceeded 1000 ppm. PCBs were also found throughout the site, generally at levels less than 100 ppm. The highest PCB levels were in the furnace and storage tank areas. VOCs were found in all areas, generally less than 1 ppm for total VOCs for priority pollutants.

In the Yard Area, VOCs were only detected in the furnace residue pile and the incoming drum storage areas. Semivolatiles (mostly base neutrals) were found mainly in the furnace and incoming drum storage areas, at levels of about 50 ppm or less. Inorganics were detected at highest levels in the furnace and furnace residue pile.

Groundwater analyses indicated the presence of PCBs in one well at a concentration of 53 ppb, but this may have been due to suspended sediment. VOCs were found in all groundwater samples, with higher concentrations of non-priority compounds (maximum 4,620 ppb), than priority compounds (maximum 1,350 ppb). Semivolatiles were only analyzed on one groundwater sample and measured 42 ppb; dioxin, cyanide, metals, and phenol were not detected in this sample.

2.3.2 Investigation by Louis Berger and Associates, Inc. (1986)

The NJ Turnpike Authority investigated the BB&D site in connection with a proposed acquisition of the property for an expansion of the turnpike. The investigation did not address the entire site; only that portion in the proposed turnpike right of way.

Contaminants detected were consistent with the Dan Raviv Associates study. Volatiles, semivolatiles, and inorganics were found in soils, including PCBs. Groundwater was found to be contaminated in one of two wells, mainly by volatiles and some semivolatiles (acid extractables). Base neutral extractables, inorganics, and PCBs were generally not elevated. The report noted that historical sources are a major contributor to contamination in subsurface soil layers.

2.3.3 Investigation by Blasland, Bouck & Lee, Inc. (1997)

The Blasland, Bouck & Lee, Inc. (BB&L) study was conducted under the Administrative Order on Consent, under contract to the Bayonne Barrel and Drum Participating Parties Group. BB&L collected soil boring in the Yard Area, Furnace Courtyard Area, and Storage Tank Area, plus surface soil samples throughout the Yard Area. The BB&L report also noted the depth to

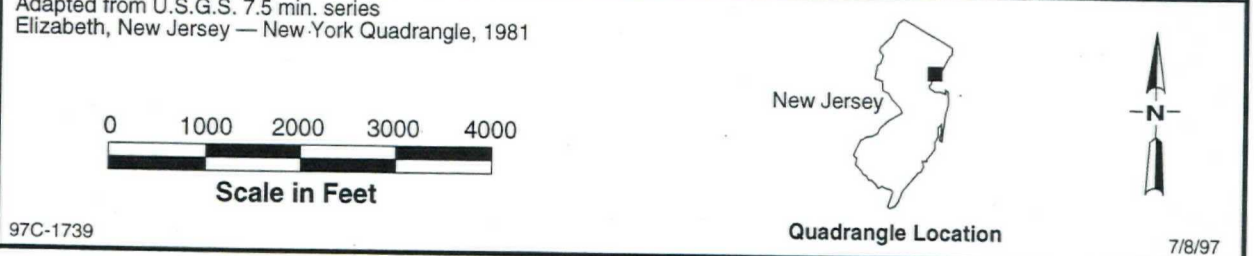
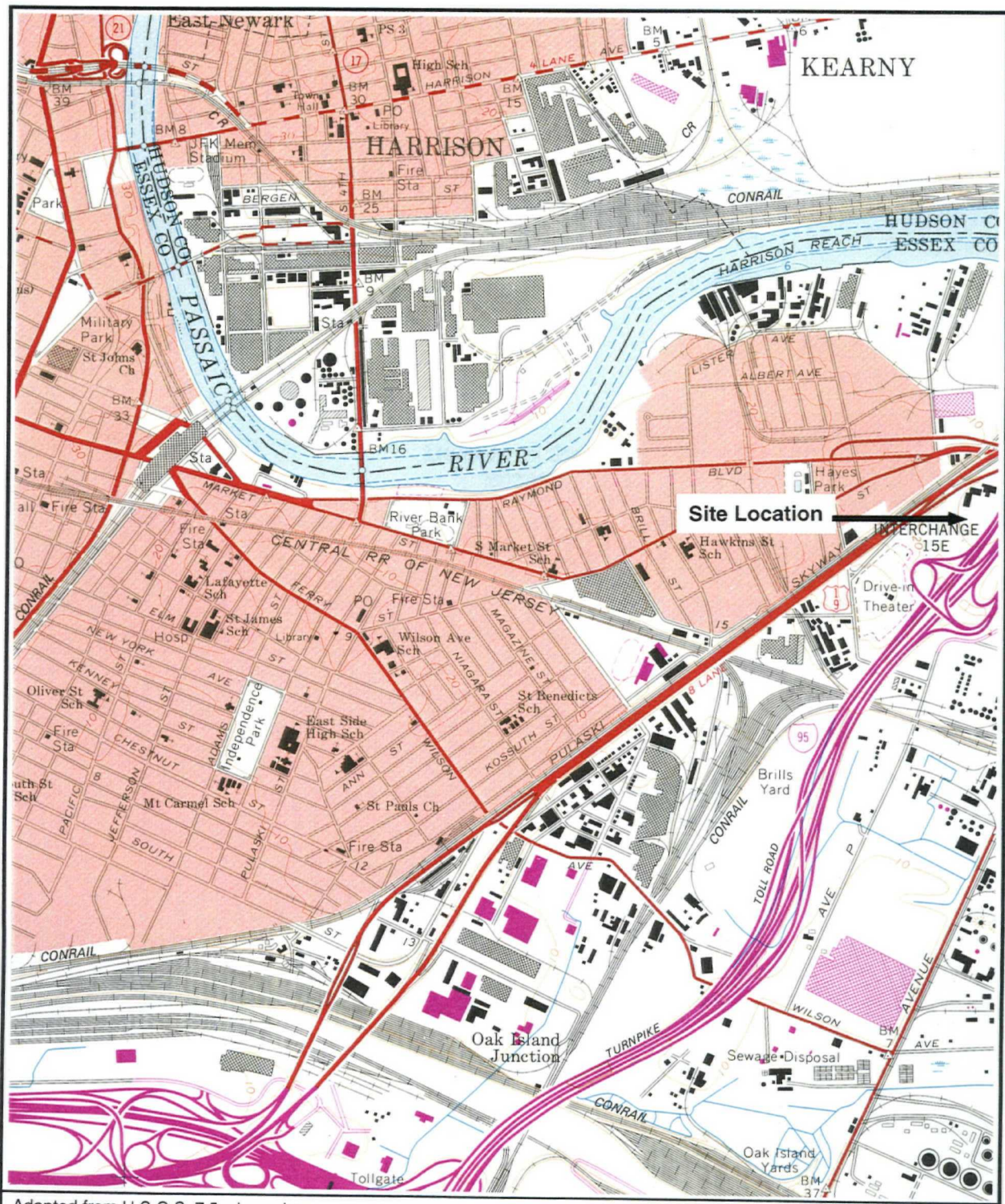
groundwater for each boring; however no wells were installed and no groundwater samples collected.

In the Furnace Courtyard Area, the results indicated that depth to groundwater was very shallow (generally less than 4 feet). The volatiles most frequently detected were ethylbenzene, toluene, and xylene, with total concentrations exceeding 10,000 ppm. Chlorinated volatile compounds were also detected, but less often and at a much lower concentration (less than 1,000 ppm). Detections of other chlorinated compounds included organochlorine pesticides (less than 10 ppm) and PCBs (generally less than 50 ppm). Metals were elevated above referenced urban background levels, with lead and chromium being detected at the highest concentrations (over 10,000 ppm). Concentrations of dioxins/dibenzofurans were converted to an equivalent concentration of 2, 3, 7, 8,-TCDD; the highest equivalent concentration was under 2 ppm.

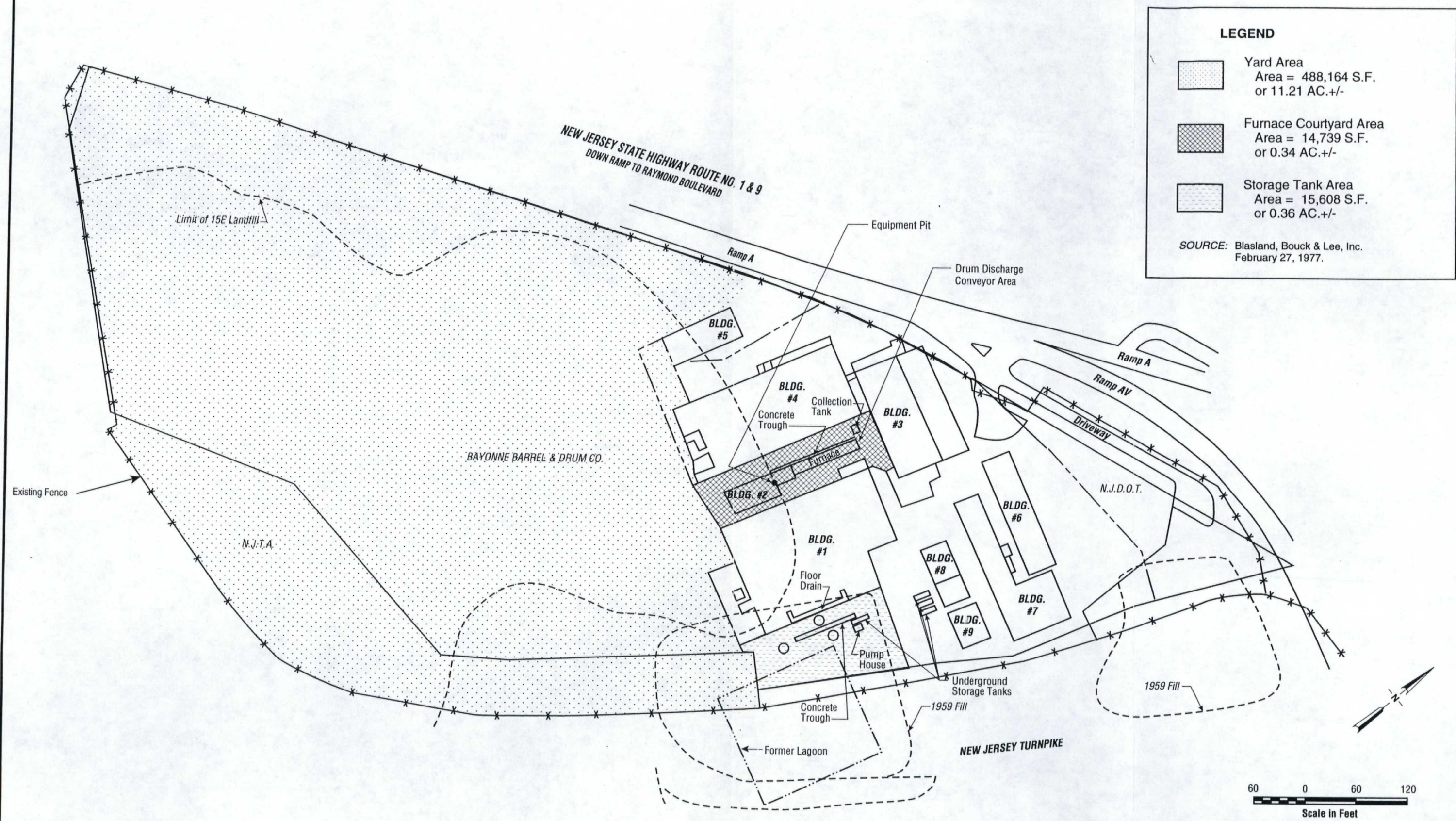
The Storage Tank Area exhibited similar contamination to the Furnace Courtyard Area. BTEX constituents were the predominant volatiles, although some chlorinated contamination was also present. Levels were approximately 2 orders of magnitude lower than the Furnace Courtyard Area. SVOCs included phthalates (less than 600 ppm) and PAHs (generally less than 10 ppm), organochlorine pesticides (less than 10 ppm) and PCBs (less than 30 ppm). Lead and zinc were detected at over 10,000 ppm. Dioxins/dibenzofurans were detected at a maximum equivalent concentration of less than 3 ppm. Groundwater was encountered at 2-3 feet below ground surface.

In the Yard Area soil borings, volatiles were at much lower levels than in the other two areas. Most results were non-detect; the highest results were for acetone at less than 1 ppm. The photoionization detector (PID) readings were 1 to 2 orders of magnitude less than the other areas. PAHs were detected to slightly over 200 ppm, phthalates to 17 ppm; organopesticides to 4 ppm, and PCBs to less than 30 ppm. Dioxins were generally less than an equivalent concentration of 10 ppb, but one sample (0-2 feet) measured 212 ppb.

The yard area surface soils had numerous PCB detections, generally less than 20 ppm, but some measurements were over 100 ppm. Lead was generally measured in the 1,000 - 10,000 ppm range. Total TCDD equivalents were measured in all samples, with maximum concentrations approaching 1 ppm (most concentrations were less than 0.01 ppm).



**FIGURE 2-1 SITE LOCATION MAP
BAYONNE BARREL & DRUM SITE**



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FIGURE 2-2 BAYONNE BARREL AND DRUM COMPANY SITE PLAN

SECTION 3

IDENTIFICATION OF REMOVAL ACTION OBJECTIVES

This section identifies the objectives for the proposed removal action at the BB&D site. The purpose, scope, and scheduling requirements for implementation on the removal action alternatives are also described in this section in order to delineate any limits of performance of removal actions described in this EE/CA based upon time, budget, technical feasibility, and relevant criteria and standards.

Removal actions that are Fund-financed are statutory limited to a \$2 million expenditure and a 12 month duration. Removal actions do not necessarily represent the ultimate remediation at a site, and, as such, should not be of such a nature as to preclude further actions.

3.1 REMOVAL ACTION OBJECTIVES

The objectives for the removal actions to be performed at the BB&D site are to:

- Prevent human and ecological exposure to harmful levels of contamination in soils.
- Mitigate the potential for migration of contaminants to groundwater.

Removal action objectives can be based on characteristics of the waste or on chemical specific levels. Characteristics of the waste refer to an acute hazard that presents an immediate danger to public safety (e.g., potential for explosion). The contamination at the BB&D site does not pose this type of threat. Chemical specific levels refer to media concentrations that exceed comparison levels for specific chemical constituents. There are several types of comparison levels. One type is called ARARs, which stands for "applicable or relevant and appropriate requirements." These would be promulgated standards, generally regulations, that are enforceable by a regulatory agency. If directly enforceable, they are considered applicable; if they are enforceable but do not directly apply to the site media, they are considered relevant and appropriate. Another type is generally referred to as TBCs, which stands for "to be considered". These are guidances or advisory levels, but are not promulgated as law and are not enforceable. ARARs and TBCs are discussed further in Section 3.2. The third type of comparison

is to calculated levels for specific compounds, based on a site-specific risk assessment. No such risk assessment has been conducted for this site.

3.2 ARARs and TBCs

SARA mandates in Section 121(d) that site remediation under CERCLA comply with the requirements of all applicable or relevant and appropriate federal and commonwealth environmental and public health laws. Applicable requirements are specific to the conditions present on the site for which all jurisdictional prerequisites of the law or requirements are satisfied. Relevant and appropriate requirements are those that do not have jurisdictional authority over the particular circumstances at the site, but that are meant to address similar situations and, therefore, are suitable for use at the site. ARARs may also impact the implementation of the removal action. These types of ARARs are not used to determine the RAOs, but are considered in the evaluation of the removal action alternatives.

In addition to legally binding laws and regulations, federal and state environmental and public health programs issue unenforceable advisories or guidance that are not legally binding. These TBCs are evaluated along with ARARs. TBCs can include health advisories, reference doses and cancer slope factors, proposed rules, guidance materials, or policy documents. When evaluating TBCs, professional judgment is required based upon the latest available information.

There are no chemical-specific ARARs for soils that would be relevant to the removal actions under this EE/CA. U.S. EPA has developed a spill cleanup policy for PCBs, which is promulgated in 40 CFR 761.120, Subpart G. These regulations are not considered ARARs because they specifically state that the policy does not apply to pre-1987 spills, which are to be remediated to requirements established at the discretion of U.S. EPA. However, because they deal with spill clean-up they may be viewed as TBCs for the contaminated soil. The regulations state that:

Soil contaminated by the spill will be decontaminated to 10 ppm PCBs by weight provided that soil is excavated to a minimum depth of 10 inches. The excavated soil will be replaced with clean soil, i.e., containing less than 1 ppm PCBs, and the spill site will be restored...

Based on this policy, a soil concentration of 1 ppm at the surface would be considered clean in an area where unrestricted contact is allowed.

In addition, New Jersey Department of Environmental Protection (NJDEP) has proposed risk-based soil cleanup levels according to three criteria: restricted access, unrestricted access, and groundwater protection. These standards have not been finalized and are therefore TBCs, not ARARs. These chemical-specific TBCs for soils are presented in Table 3-1. The term "surface soil" in Table 3-1 refers to the top two feet of soil.

U.S. EPA Region III has also developed risk-based screening levels for various compounds (Table 3-2). These values are concentrations of contaminants that have been calculated based upon assumptions as stated in the "Risk Assessment Guidance for Superfund (RAGS), Part A" (U.S. EPA, 1989), and equated to either a 10^{-6} excess lifetime cancer risk or a hazard quotient equal to 0.1 for carcinogenic and noncarcinogenic compounds, respectively. These levels are also considered TBC, although the BB&D site is not located in Region 3.

There are chemical-specific ARARs for groundwater and surface water; however, these media are not within the scope of this removal action. The Proposed New Jersey Groundwater Standards are presented (Table 3-3) to illustrate that groundwater at the site exceeds these standards, and therefore removal or isolation of source material is a goal of the Removal Action. However, no specific groundwater remediation actions will be developed or evaluated. The site is located on the former Newark 15E landfill, which was issued a permit (NJ 006408) to discharge to groundwater.

Location-specific ARARs set restrictions on remedial action activities depending on the characteristics of the site and/or its surrounding environments. Location-specific ARARs may include restrictions on remedial actions occurring within wetlands and floodplains, near locations of known endangered species, or on protected waterways. No location-specific ARARs have been identified for the BB&D site.

Action-specific ARARs are usually technology- or activity-based requirement or limitations taken with respect to established environmental programs, especially hazardous wastes. Discussion of these factors and how they relate to each removal alternative is discussed in Section 5 of this EE/CA.

Examples of the potentially applicable action-specific ARARs for the site are presented in the following subsections.

Clean Water Act (CWA)

A New Jersey Pollutant Discharge Elimination System (NJPDES) may be required if the remedy includes off-site discharging to surface water. This would include discharge of any water removed from excavations. The best available technology (BAT) that is economically achievable must be used.

Toxic Substances Control Act (TSCA)

Disposal of PCBs (40 CFR 761) is applicable if the remedy involves excavation of soils that contain PCBs.

Resource Conservation and Recovery Act (RCRA)

In general, the applicable solid waste requirements will be action-specific, applying to the remedial activities undertaken. It should be noted that RCRA regulations are limited in application to specifically-defined hazardous waste. It has not been determined that any listed hazardous waste (see Subsection 4.2.1) including dioxin wastes, was processed at BB&D. This includes dioxin wastes. However, if any soil is excavated and found to exhibit characteristics of a hazardous waste, per 40 CFR 261 (Subpart C), the excavated soil must be managed as a hazardous waste. The following are some examples of RCRA requirements (40 CFR 265) that may be applicable or relevant and appropriate:

General Waste Treatment (40 CFR 264 and 265): Although standards do not yet exist for general waste treatment in new facilities, standards do exist for interim status facilities (40 CFR 265, Subpart

O) and include specific requirements for ignitable and reactive wastes. The interim status requirements are probably not applicable if the treatment is performed on-site, but they may be relevant and appropriate.

Incineration (40 CFR 265, Subpart O): This subpart includes performance standards for incinerators and monitoring, inspection, and operating requirements.

Land Disposal Restrictions (LDRs)(40 CFR 268): This part describes general requirements that must be met to dispose of a waste at a RCRA landfill. The RCRA Land Disposal Restrictions prohibit the disposal of hazardous wastes exceeding specified contaminant levels in the landfill. There has not been a determination as to whether the excavated soils would be managed as a hazardous waste. One category of hazardous waste is called "listed" hazardous waste, meaning the wastes correspond to published lists in the RCRA regulations. In order for a waste to be considered a listed waste, some knowledge would be required as to how it was generated. The origins of the wastes at the site are unknown; therefore, there is no basis for the classification of these wastes as listed hazardous waste. Although the PAH, VOC, and dioxin concentrations exceed the LDR levels, those levels apply only to hazardous wastes, not to any contaminated media that happens to contain such constituents. Therefore, it is assumed that the LDR levels for listed hazardous waste are not ARARs for excavated site soils. RCRA also contains restrictions on "characteristic" wastes, referring to constituents or properties that can be measured in a laboratory. In regard to certain metals and organics, this restriction applies to wastes determined to be hazardous due to the tendency of the constituents of concern to leach from the waste (as measured by a test known as TCLP). In regard to characteristic constituents, there is insufficient data to determine if the site wastes would exceed the leachate concentrations under the TCLP test. However, this is certainly a possibility for lead (measured at 10,000 mg/kg, with a TCLP limit of 5 mg/L). For the purpose of this EE/CA, it is assumed that the LDRs would be triggered by lead. Therefore, pretreatment, probably by off-site stabilization, would be required prior to disposal at a landfill.

Storage (40 CFR 265, Subparts I and J): These two subparts include standards for the storage of hazardous waste in containers (Subpart I) and tanks (Subpart J).

Site Closure With Waste In Place (40 CFR 264 and 265, Subpart G): Certain sections of both 40 CFR 264 and 265 may be relevant and appropriate if the waste is to be left in place. This could include capping, installation of slurry walls, grading and covering with vegetation, or consolidation of substances in one location. Subpart G of both 264 and 265 provides technical requirements for closure and post-closure activities.

Clean Air Act (CAA)

On-site treatment operations resulting in emissions to atmosphere are regulated by NJDEP, pursuant to the Federal Clean Air Act and the New Jersey Air Pollution Control Act. Regulations applicable to BB&D include discharging of toxic volatile organic substances from on site treatment facilities.

3.3 REMOVAL ACTION SCOPE AND SCHEDULE

The removal scope for this EE/CA covers the Yard Area, the Furnace Courtyard Area, and the Storage Tank Area. The soils at these areas contain contaminants, as previously described in Section 2 of this EE/CA, that, for the most part, are a direct result of materials handling practices at BB&D. Investigation and characterization activities indicate that the waste materials pose a potential threat to human health and the environment.

These waste materials constitute a potential health and environmental hazard due to the potential for direct contact. These materials are also expected to contribute to some contaminant migration due to surface runoff; their removal will mitigate this problem. The soils have the potential to release contaminants that could migrate to surface water or groundwater. The removal or isolation of the contaminated soils will effectively eliminate threats to human health and the environment within the short-term from further release of contaminants. Correspondingly, a removal alternative will be developed to satisfy this remedial objective.

It is the responsibility of the Remediation Contractor to provide a detailed schedule and timeline of each task to U.S EPA personnel, prior to commencing any EE/CA field activities for approval. Approximate durations for the major tasks are included in the discussion of alternative implementability (Section 5 of this EE/CA).

Table 3-1

Proposed NJDEPE Soil Cleanup Standards*

Parameter	Residential Surface (mg/kg)	Nonresidential Surface (mg/kg)	Subsurface (mg/kg)
Acenaphthene	3,400	10,000	100
Acetone	1,000	1,000	100 (i)
Acrylonitrile	1	5	1 (i)
Aldrin	0.04	0.17	50
Anthracene	10,000	10,000	100 (i)
Antimony	14	340	(h)
Arsenic (Total)	20	20	(h)
Barium	700	47,000	(h)
Benzene	3	13	1
3,4-Benzofluoranthene (Benzo(b)fluoranthene)	0.9	4	50
Benzo(a)anthracene	0.9	4	500
Benzo(a)pyrene (BaP)	0.66 (f)	0.66 (f)	100
Benzo(k)fluoranthene	0.9	4	500
Benzyl alcohol	10,000 (c)	10,000 (c)	50
Beryllium	1 (f)	1 (f)	(h)
Bis(2-chloroethyl) ether	0.66 (f)	3	10 (j)
Bis (2-chloroisopropyl) ether	2,300	10,000	10
Bis (2-ethylhexyl)phthalate	49	210	100
Bromodichloromethane (Dichlorobromomethane)	11 (g)	46 (g)	1
Bromoform	86	370	1
Bromomethane	79	1,000 (d)	1
2-Butanone (MEK)	1,000 (d)	1,000 (d)	50
Butylbenzyl phthalates	1,100	10,000 (c)	100

Table 3-1
Proposed NJDEPE Soil Cleanup Standards*
(continued)

Parameter	Residential Surface (mg/kg)	Nonresidential Surface (mg/kg)	Subsurface (mg/kg)
Cadmium	1	100	(h)
Carbon tetrachloride	2 (k)	4 (k)	1
4-Chloroaniline	230	4200	(r)
Chlorobenzene	37	680	1
Chloroform	19 (k)	28 (k)	1
4-Chloro-3-methyl phenyl (p-Chloro-m-cresol)	10,000 (c)	10,000 (c)	100
Chloromethane	520	1,000 (d)	10
2-Chlorophenol	280	5,200	10 (j)
Crysene	9	40	500
Copper	600 (m)	600 (m)	(h)
Cyanide	1,100	21,000 (o)	(h)
4,4'-DDD (PP'TDE)	3	12	50 (i)
4,4'-DDE	2	9	50 (i)
4,4'-DDT	2	9	500 (i)
Diabenz(a,h)anthracene	0.66 (f)	0.66 (f)	100 (j)
Dibromochloromethane (Chlorodibromomethane)	110	1,000 (d)	1
Di-n-butyl phthalate	5,700	10,000 (c)	100
Di-n-octyl phthalate	1,100	10,000 (c)	100
1,2-Dichlorobenzene	5,100	10,000 (c)	50
1,3-Dichlorobenzene	5,100	10,000 (c)	100
1,4-Dichlorobenzene	570	10,000 (c)	100
3,3'-Dichlorobenzidine	2	6	100
1,1-Dichloroethane	570	1,000 (d)	1 (i)

Table 3-1

Proposed NJDEPE Soil Cleanup Standards*
(continued)

Parameter	Residential Surface (mg/kg)	Nonresidential Surface (mg/kg)	Subsurface (mg/kg)
1,2-Dichloroethane	6	24	1
1,1-Dichloroethene	8	150	10
1,2-Dichloroethene (trans)	1,000 (d)	1,000 (d)	50
1,2-Dichloroethene (cis)	79	1,000 (d)	1 (i)
2,4-Dichlorophenol	170	3,100	10
1,2-Dichloropropane	10	43	(r)
1,3-Dichloropropene (cis and trans)	4	5 (k)	1
Dieldrin	.042	0.18	50
Diethyl phthalate	10,000 (c)	10,000 (c)	50
2,4-Dimethyl phenol	1,100	10,000 (c)	10
Dimethyl phthalate	10,000 (c)	10,000 (c)	50
2,4-Dinitrophenol	110	2,100	10
Dinitrotoluene (2,4'/2,6' mixture)	1	4	10
Endosulfan	340 (g)	6,200 (g)	50
Endrin	17	310	50
Ethylbenzene	1,000 (d)	1,000 (d)	100
Fluoranthene	2,300	10,000 (c)	100 (i)
Fluorene	2,300	10,000 (c)	100
Heptachlor	0.15	0.65	50 (j)
Hexachlorobenzene	0.66 (f)	2	100 (j)
Hexachlorobutadiene	1 (g)	21 (g)	100 (g)
Hexachlorocyclopentadiene	400	7,300	100
Hexachloroethane	6	100	100
Indeno (1,2,3-cd) pyrene	0.9	4	500

Table 3-1
Proposed NJDEPE Soil Cleanup Standards*
(continued)

Parameter	Residential Surface (mg/kg)	Nonresidential Surface (mg/kg)	Subsurface (mg/kg)
Isophorone	1,100	10,000 (c)	50 (j)
Lead (Total)	400 (p)	600 (q)	(h)
Lindane	0.52	2.2	50 (j)
2- Methylphenol	2,800	10,000 (c)	(r)
4-Methylphenol	2,800	10,000 (c)	(r)
Methoxychlor	280	5,200	50 (i)
Mercury (Total)	14	270	(h)
4-Methyl-2-pentanone (MIBK)	1,000 (d)	1,000 (d)	50
Methylene chloride	49	210	1 (j)
Naphthalene	230	4,200	100
Nickel (soluble salts)	250	2,400 (k,n)	(h)
Nitrobenzene	28	520	10 (i)
N-Nitrosodiphenylamine	140	600	100
N-Nitrosodi-n-propylamine	0.66 (f)	0.66 (f)	10 (j)
PCBs (Polychlorinated biphenyls)	0.49	2	50 (i)
Pentachlorophenol	6	24	100
Phenol	10,000 (c)	10,000 (c)	50
Pyrene	1,700	10,000 (c)	100 (j)
Selenium (Total)	63	3,100 (n)	(h)
Silver	110	4,100 (m)	(h)
Styrene	23	97	100
1,1,1,2-Tetrachloroethane	170	310	1
1,1,2,2-Tetrachloroethane	34	70 (k)	1
Tetrachloroethylene	4 (k)	6 (k)	1

Table 3-1
Proposed NJDEPE Soil Cleanup Standards*
(continued)

Parameter	Residential Surface (mg/kg)	Nonresidential Surface (mg/kg)	Subsurface (mg/kg)
Thallium	2 (f)	2 (f)	(h)
Toluene	1,000 (d)	1,000 (d)	500
Toxaphene	0.1 (k)	0.2 (k)	50 (i)
1,2,4-Trichlorobenzene	68	1,200	100
1,1,1-Trichloroethane	210	1,000 (d)	50
1,1,2-Trichloroethane	22	420	1
Trichloroethene (TCE)	23	54 (k)	1
2,4,5-Trichlorophenol	5,600	10,000 (c)	50
2,4,6-Trichlorophenol	62	270	10 (i)
Vanadium	370	7,100 (n)	(h)
Vinyl chloride	2	7	10 (i)
Xylenes (Total)	410	1,000 (d)	10
Zinc	1,500 (m)	1,500 (m)	(h)

*Nonpromulgated; officially proposed 3 February 1992.

- (a) criteria are health based using an incidental ingestion exposure pathway except where noted below.
- (b) criteria are subject to change based on site specific factors (e.g., aquifer classification, soil type, natural background, environmental impacts, etc.).
- (c) health based criterion exceeds the 10000 mg/kg maximum for total organic contaminants.
- (d) health based criterion exceeds the 1000 mg/kg maximum for total volatile organic contaminants.
- (e) cleanup standard proposal was based on natural background.
- (f) health based criterion is lower than analytical limits; cleanup criterion based on practical quantitation level.
- (g) criterion has been recalculated based on new toxicological data.
- (h) the impact to ground water values for inorganics will be developed based upon site specific chemical and physical parameters.
- (i) original criterion was incorrectly calculated and has been recalculated.

Table 3-1

**Proposed NJDEPE Soil Cleanup Standards*
(continued)**

- (j) typographical error.
- (k) criterion based on inhalation exposure pathway which yielded a more stringent criterion than the incidental ingestion exposure pathway.
- (l) new criterion derived using methodology in the basis and background document
- (m) criterion based on ecological (phytotoxicity) effects.
- (n) level of the human health based criterion is such that evaluation for potential environmental impacts on a site by site basis is recommended.
- (o) level of the criterion is such that evaluation for potential acute exposure hazard is recommended.
- (p) criterion based on the goal that children should be exposed to the minimal amount of lead that is practicable and is reflective of natural background as altered by diffuse anthropogenic pollution. Criterion corresponds to both a median value for urban land which has not been impacted by any local point source of lead and a 90th percentile value for similar suburban land.
- (q) criterion was derived from a model developed by the Society for Environmental Geochemistry and Health (SEGH) and was designed to be protective for adults in the workplace.
- (r) insufficient information available to calculate impact to ground water criteria.

Note: "Surface" refers to the top two feet of soil

Table 3-2
EPA Region III Risk Based Concentrations

Contaminant	Basis : C=carcinogenic effects N=noncarcinogenic effects E=EPA draft Soil Screening Level S=soil saturation concentration M=EPA MCL.									
	Risk-Based Concentrations						Soil Screening Levels- Transfers from Soil to:			
	Tap Water µg/L	Ambient Air µg/m3	Fish mg/kg	Soil Ingestion			Air mg/kg	Groundwater mg/kg		
				Industrial mg/kg	Residential mg/kg					
Acephate	7.70E+00 C	7.20E-01 C	3.60E-01 C	6.60E+02 C	7.30E+01 C		0.00E+00	0.00E+00		
Acetaldehyde	9.40E+01 N	8.10E-01 C	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00		
Acetochlor	7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N		0.00E+00	0.00E+00		
Acetone	3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N		6.20E+04 B	8.00E+00 B		
Acetone cyanohydrin	2.60E+03 N	1.50E+02 N	9.50E+01 N	1.40E+05 N	5.50E+03 N		0.00E+00	0.00E+00		
Acetonitrile	2.20E+02 N	5.20E+01 N	8.10E+00 N	1.20E+04 N	4.70E+02 N		0.00E+00	0.00E+00		
Acetophenone	4.20E-02 N	2.10E-02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N		0.00E+00	0.00E+00		
Acifluorfen	4.70E+02 N	4.70E+01 N	1.80E+01 N	2.70E+04 N	1.00E+03 N		0.00E+00	0.00E+00		
Acrolein	7.30E+02 N	2.10E-02 N	2.70E+01 N	4.10E+04 N	1.60E+03 N		0.00E+00	0.00E+00		
Acrylamide	1.50E-02 C	1.40E-03 C	7.00E-04 C	1.30E+00 C	1.40E-01 C		0.00E+00	0.00E+00		
Acrylic acid	1.80E+04 N	1.00E+00 N	6.80E+02 N	1.00E+06 N	3.90E+04 N		0.00E+00	0.00E+00		
Acrylonitrile	1.20E-01 C	2.60E-02 C	5.80E-03 C	1.10E+01 C	1.20E+00 C		0.00E+00	0.00E+00		
Alachlor	8.40E-01 C	7.80E-02 C	3.90E-02 C	7.20E+01 C	8.00E+00 C		0.00E+00	0.00E+00		
Alar	5.50E+03 N	5.50E+02 N	2.00E+02 N	3.10E+05 N	1.20E+04 N		0.00E+00	0.00E+00		
Aldicarb	3.70E+01 N	3.70E+00 N	1.40E+00 N	2.00E+03 N	7.80E+01 N		5.70E+02 S	3.60E-02 M		
Aldicarb sulfone	3.70E+01 N	3.70E+00 N	1.40E+00 N	2.00E+03 N	7.80E+01 N		0.00E+00	0.00E+00		
Aldrin	4.00E-03 C	3.70E-04 C	1.90E-04 C	3.40E-01 C	3.80E-02 C		5.00E-01 B	5.00E-03 B		
Ally	9.10E+03 N	9.10E+02 N	3.40E+02 N	5.10E+05 N	2.00E+04 N		0.00E+00	0.00E+00		
Allyl alcohol	1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N		0.00E+00	0.00E+00		
Allyl chloride	1.80E+03 N	1.00E+00 N	6.80E+01 N	1.00E+05 N	3.90E+03 N		0.00E+00	0.00E+00		
Aluminum	3.70E+04 N	3.70E+03 N	1.40E+03 N	1.00E+06 N	7.80E+04 N		0.00E+00	0.00E+00		
Aluminum phosphide	1.50E+01 N	1.50E+00 N	5.40E-01 N	8.20E+02 N	3.10E+01 N		0.00E+00	0.00E+00		
Amdro	1.10E+01 N	1.10E+00 N	4.10E-01 N	6.10E+02 N	2.30E+01 N		0.00E+00	0.00E+00		
Ametryn	3.30E+02 N	3.30E+01 N	1.20E+01 N	1.80E+04 N	7.00E+02 N		0.00E+00	0.00E+00		
m-Aminophenol	2.60E+03 N	2.60E+02 N	9.50E+01 N	1.40E+05 N	5.50E+03 N		0.00E+00	0.00E+00		
4-Aminopyridine	7.30E-01 N	7.30E-02 N	2.70E-02 N	4.10E+01 N	1.60E+00 N		0.00E+00	0.00E+00		
Amitraz	9.10E+01 N	9.10E+00 N	3.40E+00 N	5.10E+03 N	2.00E+02 N		0.00E+00	0.00E+00		
Ammonia	1.00E+03 N	1.00E+02 N	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00		
Ammonium sulfamate	7.30E+03 N	7.30E+02 N	2.70E+02 N	4.10E+05 N	1.60E+04 N		0.00E+00	0.00E+00		
Aniline	1.00E+01 N	1.00E+00 N	5.50E-01 C	1.00E+03 C	1.10E+02 C		4.50E+01 N	3.10E-02 N		
Antimony and compounds	1.50E+01 N	1.50E+00 N	5.40E-01 N	8.20E+02 N	3.10E+01 N		0.00E+00	0.00E+00		
Antimony pentoxide	1.80E+01 N	1.80E+00 N	6.80E-01 N	1.00E+03 N	3.90E+01 N		0.00E+00	0.00E+00		
Antimony potassium tartrate	3.30E+01 N	3.30E+00 N	1.20E+00 N	1.80E+03 N	7.00E+01 N		0.00E+00	0.00E+00		
Antimony tetroxide	1.50E+01 N	1.50E+00 N	5.40E-01 N	8.20E+02 N	3.10E+01 N		0.00E+00	0.00E+00		
Antimony trioxide	1.50E+01 N	1.50E+00 N	5.40E-01 N	8.20E+02 N	3.10E+01 N		0.00E+00	0.00E+00		
Apollo	4.70E+02 N	4.70E+01 N	1.80E+01 N	2.70E+04 N	1.00E+03 N		0.00E+00	0.00E+00		

Table 3-2
EPA Region III Risk Based Concentrations

Contaminant	Basis : C=carcinogenic effects N=noncarcinogenic effects E=EPA draft Soil Screening Level													
	S=soil saturation concentration M=EPA MCL.													
	Risk-Based Concentrations						Soil Screening Levels- Transfers from Soil to:							
	Tap Water µg/L	Ambient Air µg/m3	Fish mg/kg	Soil Ingestion										
Industrial mg/kg				Residential mg/kg	Air mg/kg	Groundwater mg/kg								
Aramite	2.70E+00	C	2.50E-01	C	1.30E-01	C	2.30E+02	C	2.60E+01	C	0.00E+00	0.00E+00		
Arsenic	1.10E+01	N	1.10E+00	N	4.10E-01	N	6.10E+02	N	2.30E+01	N	3.80E+02	B	1.50E+01	B
Arsenic (as carcinogen)	4.50E-02	C	4.10E-04	C	2.10E-03	C	3.80E+00	C	4.30E-01	C	3.80E+02	B	1.50E+01	B
Arsine	5.20E-01	N	5.20E-02	N	0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00	
Assure	3.30E+02	N	3.30E+01	N	1.20E+01	N	1.80E+04	N	7.00E+02	N	0.00E+00		0.00E+00	
Asulam	1.80E+03	N	1.80E+02	N	6.80E+01	N	1.00E+05	N	3.90E+03	N	0.00E+00		0.00E+00	
Atrazine	3.00E-01	C	2.80E-02	C	1.40E-02	C	2.60E+01	C	2.90E+00	C	0.00E+00		0.00E+00	
Avermectin B1	1.50E+01	N	1.50E+00	N	5.40E-01	N	8.20E+02	N	3.10E+01	N	0.00E+00		0.00E+00	
Azobenzene	6.10E-01	C	5.80E-02	C	2.90E-02	C	5.20E+01	C	5.80E+00	C	0.00E+00		0.00E+00	
Barium and compounds	2.60E+03	N	5.20E-01	N	9.50E+01	N	1.40E+05	N	5.50E+03	N	3.50E+05	B	3.20E+01	B
Baygon	1.50E+02	N	1.50E+01	N	5.40E+00	N	8.20E+03	N	3.10E+02	N	0.00E+00		0.00E+00	
Bayleton	1.10E+03	N	1.10E+02	N	4.10E+01	N	6.10E+04	N	2.30E+03	N	0.00E+00		0.00E+00	
Baythroid	9.10E+02	N	9.10E+01	N	3.40E+01	N	5.10E+04	N	2.00E+03	N	0.00E+00		0.00E+00	
Benefin	1.10E+04	N	1.10E+03	N	4.10E+02	N	6.10E+05	N	2.30E+04	N	0.00E+00		0.00E+00	
Benomyl	1.80E+03	N	1.80E+02	N	6.80E+01	N	1.00E+05	N	3.90E+03	N	0.00E+00		0.00E+00	
Bentazon	9.10E+01	N	9.10E+00	N	3.40E+00	N	5.10E+03	N	2.00E+02	N	0.00E+00		0.00E+00	
Benzaldehyde	6.10E+02	N	3.70E+02	N	1.40E+02	N	2.00E+05	N	7.80E+03	N	0.00E+00		0.00E+00	
Benzene	3.60E-01	C	2.20E-01	C	1.10E-01	C	2.00E+02	C	2.20E+01	C	5.00E-01	B	2.00E-02	B
Benzenethiol	3.70E-01	N	3.70E-02	N	1.40E-02	N	2.00E+01	N	7.80E-01	N	0.00E+00		0.00E+00	
Benzidine	2.90E-04	C	2.70E-05	C	1.40E-05	C	2.50E-02	C	2.80E-03	C	1.30E+00	C	1.10E-06	C
Benzoic acid	1.50E+05	N	1.50E+04	N	5.40E+03	N	1.00E+06	N	3.10E+05	N	3.20E+02	S	2.80E+02	B
Benzotrithloride	5.20E-03	C	4.80E-04	C	2.40E-04	C	4.40E-01	C	4.90E-02	C	1.20E-02	C	7.30E-05	C
Benzyl alcohol	1.10E+04	N	1.10E+03	N	4.10E+02	N	6.10E+05	N	2.30E+04	N	0.00E+00		0.00E+00	
Benzyl chloride	6.20E-02	C	3.70E-02	C	1.90E-02	C	3.40E+01	C	3.80E+00	C	5.00E-01	C	3.60E-04	C
Beryllium and compounds	1.60E-02	C	7.50E-04	C	7.30E-04	C	1.30E+00	C	1.50E-01	C	6.90E+02	B	1.80E+02	B
Bidrin	3.70E+00	N	3.70E-01	N	1.40E-01	N	2.00E+02	N	7.80E+00	N	0.00E+00		0.00E+00	
Biphenthrin (Talstar)	5.50E+02	N	5.50E+01	N	2.00E+01	N	3.10E+04	N	1.20E+03	N	0.00E+00		0.00E+00	
1,1-Biphenyl	1.80E+03	N	1.80E+02	N	6.80E+01	N	1.00E+05	N	3.90E+03	N	9.00E+03	S	1.10E+02	N
Bis(2-chloroethyl)ether	9.20E-03	C	5.40E-03	C	2.90E-03	C	5.20E+00	C	5.80E-01	C	3.00E-01	B	3.00E-04	B
Bis(2-chloroisopropyl)ether	2.60E-01	C	1.80E-01	C	4.50E-02	C	8.20E+01	C	9.10E+00	C	0.00E+00		0.00E+00	
Bis(chloromethyl)ether	4.90E-05	C	2.90E-05	C	1.40E-05	C	2.60E-02	C	2.90E-03	C	3.70E-05	C	1.00E-07	C
Bis(2-chloro-1-methylethyl)ether	9.60E-01	C	8.90E-02	C	4.50E-02	C	8.20E+01	C	9.10E+00	C	0.00E+00		0.00E+00	
Bis(2-ethylhexyl)phthalate (DEHP)	4.80E+00	C	4.50E-01	C	2.30E-01	C	4.10E+02	C	4.60E+01	C	2.10E+02	B	1.10E+01	B
Bisphenol A	1.80E+03	N	1.80E+02	N	6.80E+01	N	1.00E+05	N	3.90E+03	N	0.00E+00		0.00E+00	
Boron (and borates)	3.30E+03	N	2.10E+01	N	1.20E+02	N	1.80E+05	N	7.00E+03	N	0.00E+00		0.00E+00	
Boron trifluoride	7.30E+00	N	7.30E-01	N	0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00	

Table 3-2
EPA Region III Risk Based Concentrations

Contaminant	Basis : C=carcinogenic effects N=noncarcinogenic effects E=EPA draft Soil Screening Level S=soil saturation concentration M=EPA MCL.							
	Risk-Based Concentrations						Soil Screening Levels- Transfers from Soil to:	
	Tap Water µg/L	Ambient Air µg/m3	Fish mg/kg	Soil Ingestion			Air mg/kg	Groundwater mg/kg
				Industrial mg/kg	Residential mg/kg			
Bromodichloromethane	1.70E-01 c	1.00E-01 c	5.10E-02 c	9.20E+01 c	1.00E+01 c		1.80E+03 B	3.00E-01 B
Bromoethene	9.60E-02 c	5.70E-02 c	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00
Bromoform (tribromomethane)	2.40E+00 c	1.60E+00 c	4.00E-01 c	7.20E+02 c	8.10E+01 c		4.60E+01 B	5.00E-01 B
Bromomethane	8.70E+00 N	5.20E+00 N	1.90E+00 N	2.90E+03 N	1.10E+02 N		2.00E+00 B	1.00E-01 B
4-Bromophenyl phenyl ether	2.10E+03 N	2.10E+02 N	7.80E+01 N	1.20E+05 N	4.50E+03 N		0.00E+00	0.00E+00
Bromophos	1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N		0.00E+00	0.00E+00
Bromoxynil	7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N		0.00E+00	0.00E+00
Bromoxynil octanoate	7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N		0.00E+00	0.00E+00
1,3-Butadiene	1.10E-02 c	6.40E-03 c	0.00E+00	0.00E+00	0.00E+00		1.30E-03 c	7.20E-05 c
1-Butanol	3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N		9.70E+03 B	8.00E+00 B
Butyl benzyl phthalate	7.30E+03 N	7.30E+02 N	2.70E+02 N	4.10E+05 N	1.60E+04 N		5.30E+02 B	6.80E+01 B
Butylate	1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N		0.00E+00	0.00E+00
sec-Butylbenzene	6.10E+01 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N		8.00E+01 S	2.70E-01 M
tert-Butylbenzene	6.10E+01 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N		0.00E+00	2.70E-01 M
Butylphthalyl butylglycolate	3.70E+04 N	3.70E+03 N	1.40E+03 N	1.00E+06 N	7.80E+04 N		0.00E+00	0.00E+00
Cacodylic acid	1.10E+02 N	1.10E+01 N	4.10E+00 N	6.10E+03 N	2.30E+02 N		0.00E+00	0.00E+00
Cadmium and compounds	1.80E+01 N	9.90E-04 c	6.80E-01 N	1.00E+03 N	3.90E+01 N		9.20E+02 B	6.00E+00 B
Caprolactam	1.80E+04 N	1.80E+03 N	6.80E+02 N	1.00E+06 N	3.90E+04 N		0.00E+00	0.00E+00
Captafol	7.80E+00 c	7.30E-01 c	3.70E-01 c	6.70E+02 c	7.40E+01 c		0.00E+00	0.00E+00
Captan	1.90E+01 c	1.80E+00 c	9.00E-01 c	1.60E+03 c	1.80E+02 c		0.00E+00	0.00E+00
Carbaryl	3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N		3.40E-01 S	2.30E+01 N
Carbofuran	1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N		0.00E+00	0.00E+00
Carbon disulfide	1.00E+03 N	7.30E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N		1.10E+01 B	1.40E+01 B
Carbon tetrachloride	1.60E-01 c	1.20E-01 c	2.40E-02 c	4.40E+01 c	4.90E+00 c		2.00E-01 B	3.00E-02 B
Carbosulfan	3.70E+02 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N		0.00E+00	0.00E+00
Carboxin	3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N		0.00E+00	0.00E+00
Chloral	7.30E+01 N	7.30E+00 N	2.70E+00 N	4.10E+03 N	1.60E+02 N		0.00E+00	0.00E+00
Chloramben	5.50E+02 N	5.50E+01 N	2.00E+01 N	3.10E+04 N	1.20E+03 N		0.00E+00	0.00E+00
Chloranil	1.70E-01 c	1.60E-02 c	7.80E-03 c	1.40E+01 c	1.60E+00 c		0.00E+00	0.00E+00
Chlordane	5.20E-02 c	4.90E-03 c	2.40E-03 c	4.40E+00 c	4.90E-01 c		1.00E+01 B	2.00E+00 B
Chlorimuron-ethyl	7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N		0.00E+00	0.00E+00
Chlorine	3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N		0.00E+00	0.00E+00
Chlorine dioxide	2.10E+00 N	2.10E-01 N	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00
Chloroacetaldehyde	2.50E+02 N	2.50E+01 N	9.30E+00 N	1.40E+04 N	5.40E+02 N		0.00E+00	0.00E+00
Chloroacetic acid	7.30E+01 N	7.30E+00 N	2.70E+00 N	4.10E+03 N	1.60E+02 N		0.00E+00	0.00E+00
2-Chloroacetophenone	3.10E-01 N	3.10E-02 N	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00

Table 3-2
EPA Region III Risk Based Concentrations

Contaminant	Basis : C=carcinogenic effects N=noncarcinogenic effects E=EPA draft Soil Screening Level S=soil saturation concentration M=EPA MCL.								
	Risk-Based Concentrations						Soil Screening Levels- Transfers from Soil to:		
	Tap Water µg/L	Ambient Air µg/m3	Fish mg/kg	Soil Ingestion			Air mg/kg	Groundwater mg/kg	
				Industrial mg/kg	Residential mg/kg				
4-Chloroaniline	1.50E+02 N	1.50E+01 N	5.40E+00 N	8.20E+03 N	3.10E+02 N		1.20E+03 S	3.00E-01 E	
Chlorobenzene	3.90E+01 N	2.10E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N		9.40E+01 E	6.00E-01 E	
Chlorobenzilate	2.50E-01 C	2.30E-02 C	1.20E-02 C	2.10E+01 C	2.40E+00 C		0.00E+00	0.00E+00	
p-Chlorobenzoic acid	7.30E+03 N	7.30E+02 N	2.70E+02 N	4.10E+05 N	1.60E+04 N		0.00E+00	0.00E+00	
4-Chlorobenzotrifluoride	7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N		8.60E+01 N	7.50E+00 N	
2-Chloro-1,3-butadiene	1.40E+01 N	7.30E+00 N	2.70E+01 N	4.10E+04 N	1.60E+03 N		0.00E+00	0.00E+00	
1-Chlorobutane	2.40E+03 N	1.50E+03 N	5.40E+02 N	8.20E+05 N	3.10E+04 N		0.00E+00	0.00E+00	
Chlorodibromomethane	1.30E-01 C	7.50E-02 C	3.80E-02 C	6.80E+01 C	7.60E+00 C		1.90E+03 E	2.00E-01 E	
1-Chloro-1,1-difluoroethane	8.70E+04 N	5.20E+04 N	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00	
Chlorodifluoromethane	8.70E+04 N	5.20E+04 N	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00	
Chloroethane	8.60E+03 N	1.00E+04 N	5.40E+02 N	8.20E+05 N	3.10E+04 N		2.60E+03 S	3.30E+01 N	
2-Chloroethyl vinyl ether	1.50E+02 N	9.10E+01 N	3.40E+01 N	5.10E+04 N	2.00E+03 N		0.00E+00	0.00E+00	
Chloroform	1.50E-01 C	7.80E-02 C	5.20E-01 C	9.40E+02 C	1.00E+02 C		2.00E-01 E	3.00E-01 E	
Chloromethane	1.40E+00 C	9.90E-01 C	2.40E-01 C	4.40E+02 C	4.90E+01 C		6.30E-02 C	6.60E-03 C	
4-Chloro-2,2-methylaniline hydrochloride	1.50E-01 C	1.40E-02 C	6.90E-03 C	1.20E+01 C	1.40E+00 C		0.00E+00	0.00E+00	
4-Chloro-2-methylaniline	1.20E-01 C	1.10E-02 C	5.40E-03 C	9.90E+00 C	1.10E+00 C		0.00E+00	0.00E+00	
beta-Chloronaphthalene	2.90E+03 N	2.90E+02 N	1.10E+02 N	1.60E+05 N	6.30E+03 N		2.80E+00 S	1.40E+02 N	
o-Chloronitrobenzene	4.20E-01 C	2.50E-01 C	1.30E-01 C	2.30E+02 C	2.60E+01 C		0.00E+00	0.00E+00	
p-Chloronitrobenzene	5.90E-01 C	3.50E-01 C	1.80E-01 C	3.20E+02 C	3.50E+01 C		0.00E+00	0.00E+00	
2-Chlorophenol	1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N		5.30E+04 E	2.00E+00 E	
2-Chloropropane	1.70E+02 N	1.00E+02 N	0.00E+00	0.00E+00	0.00E+00		2.20E+01 N	6.40E-01 N	
Chlorothalonil	6.10E+00 C	5.70E-01 C	2.90E-01 C	5.20E+02 C	5.80E+01 C		0.00E+00	0.00E+00	
o-Chlorotoluene	1.20E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N		1.20E+03 N	5.60E+00 N	
Chlorpropham	7.30E+03 N	7.30E+02 N	2.70E+02 N	4.10E+05 N	1.60E+04 N		0.00E+00	0.00E+00	
Chlorpyrifos	1.10E+02 N	1.10E+01 N	4.10E+00 N	6.10E+03 N	2.30E+02 N		0.00E+00	0.00E+00	
Chlorpyrifos-methyl	3.70E+02 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N		0.00E+00	0.00E+00	
Chlorsulfuron	1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N		0.00E+00	0.00E+00	
Chlorthiophos	2.90E+01 N	2.90E+00 N	1.10E+00 N	1.60E+03 N	6.30E+01 N		0.00E+00	0.00E+00	
Chromium III and compounds	3.70E+04 N	2.10E-03 N	1.40E+03 N	1.00E+06 N	7.80E+04 N		0.00E+00	0.00E+00	
Chromium VI and compounds	1.80E+02 N	1.50E-04 C	6.80E+00 N	1.00E+04 N	3.90E+02 N		1.40E+02 E	1.90E+01 E	
Coal tar	0.00E+00	2.80E-03 C	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00	
Cobalt	2.20E+03 N	2.20E+02 N	8.10E+01 N	1.20E+05 N	4.70E+03 N		0.00E+00	0.00E+00	
Coke Oven Emissions	0.00E+00	2.90E-03 C	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00	
Copper and compounds	1.50E+03 N	1.50E+02 N	5.40E+01 N	8.20E+04 N	3.10E+03 N		0.00E+00	0.00E+00	
Crotonaldehyde	3.50E-02 C	3.30E-03 C	1.70E-03 C	3.00E+00 C	3.40E-01 C		0.00E+00	0.00E+00	
Cumene	1.50E+03 N	9.40E+00 N	5.40E+01 N	8.20E+04 N	3.10E+03 N		8.10E+01 N	6.50E+01 N	

Table 3-2
EPA Region III Risk Based Concentrations

Contaminant	Basis : C=carcinogenic effects N=noncarcinogenic effects E=EPA draft Soil Screening Level S=soil saturation concentration M=EPA MCL.									
	Risk-Based Concentrations							Soil Screening Levels- Transfers from Soil to:		
	Tap Water µg/L	Ambient Air µg/m3	Fish mg/kg	Soil Ingestion						
				Industrial mg/kg	Residential mg/kg	Air mg/kg	Groundwater mg/kg			
Cyanides:	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
Barium cyanide	3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N	0.00E+00	0.00E+00			
Calcium cyanide	1.50E+03 N	1.50E+02 N	5.40E+01 N	8.20E+04 N	3.10E+03 N	0.00E+00	0.00E+00			
Chlorine cyanide	1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N	0.00E+00	0.00E+00			
Copper cyanide	1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N	0.00E+00	0.00E+00			
Cyanazine	8.00E-02 C	7.50E-03 C	3.80E-03 C	6.80E+00 C	7.60E-01 C	0.00E+00	0.00E+00			
Cyanogen	1.50E+03 N	1.50E+02 N	5.40E+01 N	8.20E+04 N	3.10E+03 N	0.00E+00	0.00E+00			
Cyanogen bromide	3.30E+03 N	3.30E+02 N	1.20E+02 N	1.80E+05 N	7.00E+03 N	0.00E+00	0.00E+00			
Cyanogen chloride	1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N	0.00E+00	0.00E+00			
Free cyanide	7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N	0.00E+00	0.00E+00			
Hydrogen cyanide	7.30E+02 N	3.10E+00 N	2.70E+01 N	4.10E+04 N	1.60E+03 N	0.00E+00	0.00E+00			
Potassium cyanide	1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N	0.00E+00	0.00E+00			
Potassium silver cyanide	7.30E+03 N	7.30E+02 N	2.70E+02 N	4.10E+05 N	1.60E+04 N	0.00E+00	0.00E+00			
Silver cyanide	3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N	0.00E+00	0.00E+00			
Sodium cyanide	1.50E+03 N	1.50E+02 N	5.40E+01 N	8.20E+04 N	3.10E+03 N	0.00E+00	0.00E+00			
Thiocyanate	7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N	0.00E+00	0.00E+00			
Zinc cyanide	1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N	0.00E+00	0.00E+00			
Cyclohexanone	3.00E+04 N	1.80E+04 N	6.80E+03 N	1.00E+06 N	3.90E+05 N	0.00E+00	0.00E+00			
Cyclohexamine	7.30E+03 N	7.30E+02 N	2.70E+02 N	4.10E+05 N	1.60E+04 N	0.00E+00	0.00E+00			
Cyhalothrin/Karate	1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N	0.00E+00	0.00E+00			
Cypermethrin	3.70E+02 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N	0.00E+00	0.00E+00			
Cyromazine	2.70E+02 N	2.70E+01 N	1.00E+01 N	1.50E+04 N	5.90E+02 N	0.00E+00	0.00E+00			
Dacthal	3.70E+02 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N	0.00E+00	0.00E+00			
Dalapon	1.10E+03 N	1.10E+02 N	4.10E+01 N	6.10E+04 N	2.30E+03 N	0.00E+00	0.00E+00			
Danitol	9.10E+02 N	9.10E+01 N	3.40E+01 N	5.10E+04 N	2.00E+03 N	0.00E+00	0.00E+00			
DDD	2.80E-01 C	2.60E-02 C	1.30E-02 C	2.40E+01 C	2.70E+00 C	3.70E+01 S	7.00E-01 B			
DDE	2.00E-01 C	1.80E-02 C	9.30E-03 C	1.70E+01 C	1.90E+00 C	1.00E+01 S	5.00E-01 B			
DDT	2.00E-01 C	1.80E-02 C	9.30E-03 C	1.70E+01 C	1.90E+00 C	8.00E+01 B	1.00E+00 B			
Decabromodiphenyl ether	6.10E+01 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N	0.00E+00	0.00E+00			
Demeton	1.50E+00 N	1.50E-01 N	5.40E-02 N	8.20E+01 N	3.10E+00 N	0.00E+00	0.00E+00			
Diallate	1.70E-01 C	1.00E-01 C	5.20E-02 C	9.40E+01 C	1.00E+01 C	0.00E+00	0.00E+00			
Diazinon	3.30E+01 N	3.30E+00 N	1.20E+00 N	1.80E+03 N	7.00E+01 N	5.40E+03 S	2.80E+00 N			
Dibenzofuran	1.50E+02 N	1.50E+01 N	5.40E+00 N	8.20E+03 N	3.10E+02 N	1.20E+02 S	1.20E+02 N			
1,4-Dibromobenzene	6.10E+01 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N	0.00E+00	0.00E+00			
1,2-Dibromo-3-chloropropane	4.80E-02 C	2.10E-01 N	2.30E-03 C	4.10E+00 C	4.60E-01 C	1.90E+00 N	6.10E-04 M			
1,2-Dibromoethane	7.50E-04 C	8.10E-03 C	3.70E-05 C	6.70E-02 C	7.50E-03 C	5.80E-03 C	1.80E-04 M			

Table 3-2
EPA Region III Risk Based Concentrations

Contaminant	Basis : C=carcinogenic effects N=noncarcinogenic effects E=EPA draft Soil Screening Level S=soil saturation concentration M=EPA MCL.									
	Risk-Based Concentrations						Soil Screening Levels- Transfers from Soil to:			
	Tap Water µg/L	Ambient Air µg/m3	Fish mg/kg	Soil Ingestion		Air mg/kg	Groundwater mg/kg			
				Industrial mg/kg	Residential mg/kg					
Dibutyl phthalate	3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N	1.00E+02 B	1.20E+02 E			
Dicamba	1.10E+03 N	1.10E+02 N	4.10E+01 N	6.10E+04 N	2.30E+03 N	0.00E+00	0.00E+00			
1,2-Dichlorobenzene	2.70E+02 N	1.50E+02 N	1.20E+02 N	1.80E+05 N	7.00E+03 N	3.00E+02 B	6.00E+00 B			
1,3-Dichlorobenzene	5.40E+02 N	3.20E+02 N	1.20E+02 N	1.80E+05 N	7.00E+03 N	0.00E+00	0.00E+00			
1,4-Dichlorobenzene	4.40E-01 C	2.60E-01 C	1.30E-01 C	2.40E+02 C	2.70E+01 C	7.70E+03 B	1.00E+00 B			
3,3'-Dichlorobenzidine	1.50E-01 C	1.40E-02 C	7.00E-03 C	1.30E+01 C	1.40E+00 C	5.20E+01 S	1.00E-02 B			
1,4-Dichloro-2-butene	1.10E-03 C	6.70E-04 C	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00			
Dichlorodifluoromethane	3.90E+02 N	2.10E+02 N	2.70E+02 N	4.10E+05 N	1.60E+04 N	3.70E+01 N	7.50E+00 N			
1,1-Dichloroethane	8.10E+02 N	5.20E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N	9.80E+02 B	1.10E+01 B			
1,2-Dichloroethane (EDC)	1.20E-01 C	6.90E-02 C	3.50E-02 C	6.30E+01 C	7.00E+00 C	3.00E-01 B	1.00E-02 B			
1,1-Dichloroethylene	4.40E-02 C	3.60E-02 C	5.30E-03 C	9.50E+00 C	1.10E+00 C	4.00E-02 B	3.00E-02 B			
1,2-Dichloroethylene (cis)	6.10E+01 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N	1.50E+03 B	2.00E-01 B			
1,2-Dichloroethylene (trans)	1.20E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N	3.60E+03 B	3.00E-01 B			
1,2-Dichloroethylene (mixture)	5.50E+01 N	3.30E+01 N	1.20E+01 N	1.80E+04 N	7.00E+02 N	0.00E+00	0.00E+00			
2,4-Dichlorophenol	1.10E+02 N	1.10E+01 N	4.10E+00 N	6.10E+03 N	2.30E+02 N	4.80E+03 S	5.00E-01 B			
2,4-Dichlorophenoxyacetic Acid (2,4-D)	6.10E+01 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N	7.00E+03 S	1.70E+00 M			
4-(2,4-Dichlorophenoxy)butyric Acid	2.90E+02 N	2.90E+01 N	1.10E+01 N	1.60E+04 N	6.30E+02 N	0.00E+00	0.00E+00			
1,2-Dichloropropane	1.60E-01 C	9.20E-02 C	4.60E-02 C	8.40E+01 C	9.40E+00 C	1.10E+01 B	2.00E-02 B			
2,3-Dichloropropanol	1.10E+02 N	1.10E+01 N	4.10E+00 N	6.10E+03 N	2.30E+02 N	0.00E+00	0.00E+00			
1,3-Dichloropropene	7.70E-02 C	4.80E-02 C	1.80E-02 C	3.30E+01 C	3.70E+00 C	1.00E-01 B	1.00E-03 B			
Dichlorvos	2.30E-01 C	2.20E-02 C	1.10E-02 C	2.00E+01 C	2.20E+00 C	3.50E+00 C	7.20E-04 C			
Dicofol	1.50E-01 C	1.40E-02 C	7.20E-03 C	1.30E+01 C	1.50E+00 C	0.00E+00	0.00E+00			
Dicyclopentadiene	4.20E-01 N	2.10E-01 N	4.10E+01 N	6.10E+04 N	2.30E+03 N	0.00E+00	0.00E+00			
Dieldrin	4.20E-03 C	3.90E-04 C	2.00E-04 C	3.60E-01 C	4.00E-02 C	2.00E+00 B	1.00E-03 B			
Diesel emissions	5.20E+01 N	5.20E+00 N	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00			
Diethyl phthalate	2.90E+04 N	2.90E+03 N	1.10E+03 N	1.00E+06 N	6.30E+04 N	5.20E+02 B	1.10E+02 B			
Diethylene glycol, monobutyl ether	2.10E+02 N	2.10E+01 N	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00			
Diethylene glycol, monoethyl ether	7.30E+04 N	7.30E+03 N	2.70E+03 N	1.00E+06 N	1.60E+05 N	0.00E+00	0.00E+00			
Diethylformamide	4.00E+02 N	4.00E+01 N	1.50E+01 N	2.20E+04 N	8.60E+02 N	0.00E+00	0.00E+00			
Di(2-ethylhexyl)adipate	5.60E+01 C	5.20E+00 C	2.60E+00 C	4.80E+03 C	5.30E+02 C	0.00E+00	0.00E+00			
Diethylstilbestrol	1.40E-05 C	1.30E-06 C	7.00E-07 C	1.20E-03 C	1.40E-04 C	0.00E+00	0.00E+00			
Difenzoquat (Avenge)	2.90E+03 N	2.90E+02 N	1.10E+02 N	1.60E+05 N	6.30E+03 N	0.00E+00	0.00E+00			
Disflubenzuron	7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N	0.00E+00	0.00E+00			
1,1-Difluoroethane	6.90E+04 N	4.20E+04 N	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00			
Diisopropyl methylphosphonate (DIMP)	2.90E+03 N	2.90E+02 N	1.10E+02 N	1.60E+05 N	6.30E+03 N	0.00E+00	0.00E+00			
Dimethipin	7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N	0.00E+00	0.00E+00			

Table 3-2
EPA Region III Risk Based Concentrations

Contaminant	Basis : C=carcinogenic effects N=noncarcinogenic effects E=EPA draft Soil Screening Level S=soil saturation concentration M=EPA MCL.									
	Risk-Based Concentrations							Soil Screening Levels- Transfers from Soil to:		
	Tap Water µg/L		Ambient Air µg/m3		Fish mg/kg		Soil Ingestion		Air mg/kg	Groundwater mg/kg
							Industrial mg/kg	Residential mg/kg		
Dimethoate	7.30E+00	N	7.30E-01	N	2.70E-01	N	4.10E+02	1.60E+01	0.00E+00	0.00E+00
3,3'-Dimethoxybenzidine	4.80E+00	C	4.50E-01	C	2.30E-01	C	4.10E+02	4.60E+01	0.00E+00	0.00E+00
Dimethylamine	2.10E-01	N	2.10E-02	N	0.00E+00		0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4-Dimethylaniline hydrochloride	1.20E-01	C	1.10E-02	C	5.40E-03	C	9.90E+00	1.10E+00	0.00E+00	0.00E+00
2,4-Dimethylaniline	9.00E-02	C	8.30E-03	C	4.20E-03	C	7.60E+00	8.50E-01	0.00E+00	0.00E+00
N-N-Dimethylaniline	7.30E+01	N	7.30E+00	N	2.70E+00	N	4.10E+03	1.60E+02	0.00E+00	0.00E+00
3,3'-Dimethylbenzidine	7.30E-03	C	6.80E-04	C	3.40E-04	C	6.20E-01	6.90E-02	2.90E+01	3.90E-04
N,N-Dimethylformamide	3.70E+03	N	3.10E+01	N	1.40E+02	N	2.00E+05	7.80E+03	0.00E+00	0.00E+00
1,1-Dimethylhydrazine	2.60E-02	C	1.80E-03	C	1.20E-03	C	2.20E+00	2.50E-01	0.00E+00	0.00E+00
1,2-Dimethylhydrazine	1.80E-03	C	1.70E-04	C	8.50E-05	C	1.50E-01	1.70E-02	0.00E+00	0.00E+00
2,4-Dimethylphenol	7.30E+02	N	7.30E+01	N	2.70E+01	N	4.10E+04	1.60E+03	5.40E+03	3.00E+00
2,6-Dimethylphenol	2.20E+01	N	2.20E+00	N	8.10E-01	N	1.20E+03	4.70E+01	0.00E+00	0.00E+00
3,4-Dimethylphenol	3.70E+01	N	3.70E+00	N	1.40E+00	N	2.00E+03	7.80E+01	0.00E+00	0.00E+00
Dimethyl phthalate	3.70E+05	N	3.70E+04	N	1.40E+04	N	1.00E+06	7.80E+05	1.60E+03	1.20E+03
Dimethyl terephthalate	3.70E+03	N	3.70E+02	N	1.40E+02	N	2.00E+05	7.80E+03	0.00E+00	0.00E+00
1,2-Dinitrobenzene	1.50E+01	N	1.50E+00	N	5.40E-01	N	8.20E+02	3.10E+01	0.00E+00	0.00E+00
1,3-Dinitrobenzene	3.70E+00	N	3.70E-01	N	1.40E-01	N	2.00E+02	7.80E+00	0.00E+00	0.00E+00
1,4-Dinitrobenzene	1.50E+01	N	1.50E+00	N	5.40E-01	N	8.20E+02	3.10E+01	0.00E+00	0.00E+00
4,6-Dinitro-o-cyclohexyl phenol	7.30E+01	N	7.30E+00	N	2.70E+00	N	4.10E+03	1.60E+02	0.00E+00	0.00E+00
2,4-Dinitrophenol	7.30E+01	N	7.30E+00	N	2.70E+00	N	4.10E+03	1.60E+02	3.60E+02	1.00E-01
Dinitrotoluene mixture	9.90E-02	C	9.20E-03	C	4.60E-03	C	8.40E+00	9.40E-01	0.00E+00	0.00E+00
2,4-Dinitrotoluene	7.30E+01	N	7.30E+00	N	2.70E+00	N	4.10E+03	1.60E+02	1.20E+02	2.00E-01
2,6-Dinitrotoluene	3.70E+01	N	3.70E+00	N	1.40E+00	N	2.00E+03	7.80E+01	3.70E+02	1.00E-01
Dinoseb	3.70E+01	N	3.70E+00	N	1.40E+00	N	2.00E+03	7.80E+01	0.00E+00	0.00E+00
di-n-Octyl phthalate	7.30E+02	N	7.30E+01	N	2.70E+01	N	4.10E+04	1.60E+03	1.00E+06	1.00E+06
1,4-Dioxane	6.10E+00	C	5.70E-01	C	2.90E-01	C	5.20E+02	5.80E+01	0.00E+00	0.00E+00
Diphenamid	1.10E+03	N	1.10E+02	N	4.10E+01	N	6.10E+04	2.30E+03	0.00E+00	0.00E+00
Diphenylamine	9.10E+02	N	9.10E+01	N	3.40E+01	N	5.10E+04	2.00E+03	0.00E+00	0.00E+00
1,2-Diphenylhydrazine	8.40E-02	C	8.10E-03	C	3.90E-03	C	7.20E+00	8.00E-01	0.00E+00	0.00E+00
Diquat	8.00E+01	N	8.00E+00	N	3.00E+00	N	4.50E+03	1.70E+02	0.00E+00	0.00E+00
Direct black 38	7.80E-03	C	7.30E-04	C	3.70E-04	C	6.70E-01	7.40E-02	0.00E+00	0.00E+00
Direct blue 6	8.30E-03	C	7.70E-04	C	3.90E-04	C	7.10E-01	7.90E-02	0.00E+00	0.00E+00
Direct brown 95	7.20E-03	C	6.70E-04	C	3.40E-04	C	6.20E-01	6.90E-02	0.00E+00	0.00E+00
Disulfoton	1.50E+00	N	1.50E-01	N	5.40E-02	N	8.20E+01	3.10E+00	0.00E+00	0.00E+00
1,4-Dithiane	3.70E+02	N	3.70E+01	N	1.40E+01	N	2.00E+04	7.80E+02	0.00E+00	0.00E+00
Diuron	7.30E+01	N	7.30E+00	N	2.70E+00	N	4.10E+03	1.60E+02	0.00E+00	0.00E+00

Table 3-2
EPA Region III Risk Based Concentrations

Contaminant	Basis : C=carcinogenic effects N=noncarcinogenic effects E=EPA draft Soil Screening Level S=soil saturation concentration M=EPA MCL.									
	Risk-Based Concentrations						Soil Screening Levels- Transfers from Soil to:			
	Tap Water µg/L	Ambient Air µg/m3	Fish mg/kg	Soil Ingestion			Air mg/kg	Groundwater mg/kg		
				Industrial mg/kg	Residential mg/kg					
Dodine	1.50E+02 N	1.50E+01 N	5.40E+00 N	8.20E+03 N	3.10E+02 N		0.00E+00	0.00E+00		
Endosulfan	2.20E+02 N	2.20E+01 N	8.10E+00 N	1.20E+04 N	4.70E+02 N		1.00E+00 S	3.00E+00 B		
Endothall	7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N		0.00E+00	0.00E+00		
Endrin	1.10E+01 N	1.10E+00 N	4.10E-01 N	6.10E+02 N	2.30E+01 N		1.60E+01 S	4.00E-01 B		
Epichlorohydrin	6.80E+00 C	1.00E+00 N	3.20E-01 C	5.80E+02 C	6.50E+01 C		0.00E+00	0.00E+00		
1,2-Epoxybutane	2.10E+02 N	2.10E+01 N	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00		
Ethephon (2-chloroethyl phosphonic acid)	1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N		0.00E+00	0.00E+00		
Ethion	1.80E+01 N	1.80E+00 N	6.80E-01 N	1.00E+03 N	3.90E+01 N		0.00E+00	0.00E+00		
2-Ethoxyethanol acetate	1.10E+04 N	1.10E+03 N	4.10E+02 N	6.10E+05 N	2.30E+04 N		0.00E+00	0.00E+00		
2-Ethoxyethanol	1.50E+04 N	2.10E+02 N	5.40E+02 N	8.20E+05 N	3.10E+04 N		0.00E+00	0.00E+00		
Ethyl acrylate	1.40E+00 C	1.30E-01 C	6.60E-02 C	1.20E+02 C	1.30E+01 C		0.00E+00	0.00E+00		
EPTC (S-Ethyl dipropylthiocarbamate)	9.10E+02 N	9.10E+01 N	3.40E+01 N	5.10E+04 N	2.00E+03 N		0.00E+00	0.00E+00		
Ethyl acetate	3.30E+04 N	3.30E+03 N	1.20E+03 N	1.00E+06 N	7.00E+04 N		0.00E+00	0.00E+00		
Ethylbenzene	1.30E+03 N	1.00E+03 N	1.40E+02 N	2.00E+05 N	7.80E+03 N		2.60E+02 B	5.00E+00 B		
Ethylene cyanohydrin	1.10E+04 N	1.10E+03 N	4.10E+02 N	6.10E+05 N	2.30E+04 N		0.00E+00	0.00E+00		
Ethylene diamine	7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N		0.00E+00	0.00E+00		
Ethylene glycol	7.30E+04 N	7.30E+03 N	2.70E+03 N	1.00E+06 N	1.60E+05 N		0.00E+00	0.00E+00		
Ethylene glycol, monobutyl ether	2.10E+02 N	2.10E+01 N	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00		
Ethylene oxide	6.60E-02 C	1.80E-02 C	3.10E-03 C	5.60E+00 C	6.30E-01 C		0.00E+00	0.00E+00		
Ethylene thiourea (ETU)	5.70E-01 C	5.30E-02 C	2.70E-02 C	4.80E+01 C	5.40E+00 C		0.00E+00	0.00E+00		
Ethyl ether	1.20E+03 N	7.30E+02 N	2.70E+02 N	4.10E+05 N	1.60E+04 N		0.00E+00	0.00E+00		
Ethyl methacrylate	3.30E+03 N	3.30E+02 N	1.20E+02 N	1.80E+05 N	7.00E+03 N		0.00E+00	0.00E+00		
Ethyl p-nitrophenyl phenylphosphorothioate	3.70E-01 N	3.70E-02 N	1.40E-02 N	2.00E+01 N	7.80E-01 N		0.00E+00	0.00E+00		
Ethyl nitrosourea	4.80E-04 C	4.50E-05 C	2.30E-05 C	4.10E-02 C	4.60E-03 C		0.00E+00	0.00E+00		
Ethylphthalyl ethyl glycolate	1.10E+05 N	1.10E+04 N	4.10E+03 N	1.00E+06 N	2.30E+05 N		0.00E+00	0.00E+00		
Express	2.90E+02 N	2.90E+01 N	1.10E+01 N	1.60E+04 N	6.30E+02 N		0.00E+00	0.00E+00		
Fenamiphos	9.10E+00 N	9.10E-01 N	3.40E-01 N	5.10E+02 N	2.00E+01 N		0.00E+00	0.00E+00		
Fluometuron	4.70E+02 N	4.70E+01 N	1.80E+01 N	2.70E+04 N	1.00E+03 N		0.00E+00	0.00E+00		
Fluoride	2.20E+03 N	2.20E+02 N	8.10E+01 N	1.20E+05 N	4.70E+03 N		0.00E+00	0.00E+00		
Fluoridone	2.90E+03 N	2.90E+02 N	1.10E+02 N	1.60E+05 N	6.30E+03 N		0.00E+00	0.00E+00		
Flurprimidol	7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N		0.00E+00	0.00E+00		
Flutolanil	2.20E+03 N	2.20E+02 N	8.10E+01 N	1.20E+05 N	4.70E+03 N		0.00E+00	0.00E+00		
Fluvalinate	3.70E+02 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N		0.00E+00	0.00E+00		
Folpet	1.90E+01 C	1.80E+00 C	9.00E-01 C	1.60E+03 C	1.80E+02 C		0.00E+00	0.00E+00		
Fomesafen	3.50E-01 C	3.30E-02 C	1.70E-02 C	3.00E+01 C	3.40E+00 C		0.00E+00	0.00E+00		
Fonofos	7.30E+01 N	7.30E+00 N	2.70E+00 N	4.10E+03 N	1.60E+02 N		0.00E+00	0.00E+00		

Table 3-2
EPA Region III Risk Based Concentrations

Contaminant	Basis : C=carcinogenic effects N=noncarcinogenic effects E=EPA draft Soil Screening Level S=soil saturation concentration M=EPA MCL.									
	Risk-Based Concentrations							Soil Screening Levels- Transfers from Soil to:		
	Tap Water µg/L		Ambient Air µg/m ³		Fish mg/kg		Soil Ingestion		Air mg/kg	Groundwater mg/kg
							Industrial mg/kg	Residential mg/kg		
Formaldehyde	7.30E+03	N	1.40E-01	C	2.70E+02	N	4.10E+05	1.60E+04	0.00E+00	0.00E+00
Formic Acid	7.30E+04	N	7.30E+03	N	2.70E+03	N	1.00E+06	1.60E+05	0.00E+00	0.00E+00
Fosetyl-al	1.10E+05	N	1.10E+04	N	4.10E+03	N	1.00E+06	2.30E+05	0.00E+00	0.00E+00
Furan	3.70E+01	N	3.70E+00	N	1.40E+00	N	2.00E+03	7.80E+01	0.00E+00	0.00E+00
Furazolidone	1.80E-02	C	1.60E-03	C	8.30E-04	C	1.50E+00	1.70E-01	0.00E+00	0.00E+00
Furfural	1.10E+02	N	5.20E+01	N	4.10E+00	N	6.10E+03	2.30E+02	0.00E+00	0.00E+00
Furium	1.30E-03	C	1.30E-04	C	6.30E-05	C	1.10E-01	1.30E-02	0.00E+00	0.00E+00
Furmecyclo	2.20E+00	C	2.10E-01	C	1.10E-01	C	1.90E+02	2.10E+01	0.00E+00	0.00E+00
Glufosinate-ammonium	1.50E+01	N	1.50E+00	N	5.40E-01	N	8.20E+02	3.10E+01	0.00E+00	0.00E+00
Glycidaldehyde	1.50E+01	N	1.00E+00	N	5.40E-01	N	8.20E+02	3.10E+01	0.00E+00	0.00E+00
Glyphosate	3.70E+03	N	3.70E+02	N	1.40E+02	N	2.00E+05	7.80E+03	0.00E+00	0.00E+00
Haloxypop-methyl	1.80E+00	N	1.80E-01	N	6.80E-02	N	1.00E+02	3.90E+00	0.00E+00	0.00E+00
Harmony	4.70E+02	N	4.70E+01	N	1.80E+01	N	2.70E+04	1.00E+03	0.00E+00	0.00E+00
HCH (alpha)	1.10E-02	C	9.90E-04	C	5.00E-04	C	9.10E-01	1.00E-01	9.00E-01	4.00E-04
HCH (beta)	3.70E-02	C	3.50E-03	C	1.80E-03	C	3.20E+00	3.50E-01	1.60E+01	2.00E-03
HCH (gamma) Lindane	5.20E-02	C	4.80E-03	C	2.40E-03	C	4.40E+00	4.90E-01	4.20E+00	6.00E-03
HCH-technical	3.70E-02	C	3.50E-03	C	1.80E-03	C	3.20E+00	3.50E-01	0.00E+00	0.00E+00
Heptachlor	2.30E-03	C	1.40E-03	C	7.00E-04	C	1.30E+00	1.40E-01	3.00E-01	6.00E-02
Heptachlor epoxide	1.20E-03	C	6.90E-04	C	3.50E-04	C	6.30E-01	7.00E-02	1.00E+00	3.00E-02
Hexabromobenzene	1.20E+01	N	7.30E+00	N	2.70E+00	N	4.10E+03	1.60E+02	0.00E+00	0.00E+00
Hexachlorobenzene	6.60E-03	C	3.90E-03	C	2.00E-03	C	3.60E+00	4.00E-01	1.00E+00	8.00E-01
Hexachlorobutadiene	1.40E-01	C	8.10E-02	C	4.00E-02	C	7.30E+01	8.20E+00	1.00E+00	1.00E-01
Hexachlorocyclopentadiene	1.50E-01	N	7.30E-02	N	9.50E+00	N	1.40E+04	5.50E+02	2.00E+00	1.00E+01
Hexachlorodibenzo-p-dioxin mixture	1.10E-05	C	1.40E-06	C	5.00E-07	C	9.20E-04	1.00E-04	0.00E+00	0.00E+00
Hexachloroethane	7.50E-01	C	4.50E-01	C	2.30E-01	C	4.10E+02	4.60E+01	4.90E+01	2.00E-01
Hexachlorophene	1.10E+01	N	1.10E+00	N	4.10E-01	N	6.10E+02	2.30E+01	0.00E+00	0.00E+00
Hexahydro-1,3,5-trinitro-1,3,5-triazine	6.10E-01	C	5.70E-02	C	2.90E-02	C	5.20E+01	5.80E+00	0.00E+00	0.00E+00
1,6-Hexamethylene diisocyanate	1.00E-01	N	1.00E-02	N	0.00E+00		0.00E+00	0.00E+00	0.00E+00	0.00E+00
n-Hexane	3.50E+02	N	2.10E+02	N	8.10E+01	N	1.20E+05	4.70E+03	3.20E+01	1.30E+01
Hexazinone	1.20E+03	N	1.20E+02	N	4.50E+01	N	6.70E+04	2.60E+03	0.00E+00	0.00E+00
Hydrazine, hydrazine sulfate	2.20E-02	C	3.70E-04	C	1.10E-03	C	1.90E+00	2.10E-01	0.00E+00	0.00E+00
Hydrogen chloride	2.10E+02	N	2.10E+01	N	0.00E+00		0.00E+00	0.00E+00	0.00E+00	0.00E+00
Hydrogen sulfide	1.10E+02	N	1.00E+00	N	4.10E+00	N	6.10E+03	2.30E+02	0.00E+00	0.00E+00
Hydroquinone	1.50E+03	N	1.50E+02	N	5.40E+01	N	8.20E+04	3.10E+03	0.00E+00	0.00E+00
Imazalil	4.70E+02	N	4.70E+01	N	1.80E+01	N	2.70E+04	1.00E+03	0.00E+00	0.00E+00
Imazaquin	9.10E+03	N	9.10E+02	N	3.40E+02	N	5.10E+05	2.00E+04	0.00E+00	0.00E+00

Table 3-2
EPA Region III Risk Based Concentrations

Contaminant	Basis : C=carcinogenic effects N=noncarcinogenic effects E=EPA draft Soil Screening Level S=soil saturation concentration M=EPA MCL.									
	Risk-Based Concentrations						Soil Screening Levels- Transfers from Soil to:			
	Tap Water µg/L	Ambient Air µg/m3	Fish mg/kg	Soil Ingestion			Air mg/kg	Groundwater mg/kg		
				Industrial mg/kg	Residential mg/kg					
Iprodione	1.50E+03 N	1.50E+02 N	5.40E+01 N	8.20E+04 N	3.10E+03 N		0.00E+00	0.00E+00		
Iron	1.10E+04 N	1.10E+03 N	4.10E+02 N	6.10E+05 N	2.30E+04 N		0.00E+00	0.00E+00		
Isobutanol	1.80E+03 N	1.10E+03 N	4.10E+02 N	6.10E+05 N	2.30E+04 N		0.00E+00	0.00E+00		
Isophorone	7.10E+01 C	6.60E+00 C	3.30E+00 C	6.00E+03 C	6.70E+02 C		3.40E+03 B	2.00E-01 B		
Isopropalin	5.50E+02 N	5.50E+01 N	2.00E+01 N	3.10E+04 N	1.20E+03 N		0.00E+00	0.00E+00		
Isopropyl methyl phosphonic acid	3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N		0.00E+00	0.00E+00		
Isoxaben	1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N		0.00E+00	0.00E+00		
Kepone	3.70E-03 C	3.50E-04 C	1.80E-04 C	3.20E-01 C	3.50E-02 C		0.00E+00	0.00E+00		
Lactofen	7.30E+01 N	7.30E+00 N	2.70E+00 N	4.10E+03 N	1.60E+02 N		0.00E+00	0.00E+00		
Linuron	7.30E+01 N	7.30E+00 N	2.70E+00 N	4.10E+03 N	1.60E+02 N		0.00E+00	0.00E+00		
Lithium	7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N		0.00E+00	0.00E+00		
Londax	7.30E+03 N	7.30E+02 N	2.70E+02 N	4.10E+05 N	1.60E+04 N		0.00E+00	0.00E+00		
Malathion	7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N		0.00E+00	0.00E+00		
Maleic anhydride	3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N		0.00E+00	0.00E+00		
Maleic hydrazide	1.80E+04 N	1.80E+03 N	6.80E+02 N	1.00E+06 N	3.90E+04 N		0.00E+00	0.00E+00		
Malononitrile	7.30E-01 N	7.30E-02 N	2.70E-02 N	4.10E+01 N	1.60E+00 N		0.00E+00	0.00E+00		
Mancozeb	1.10E+03 N	1.10E+02 N	4.10E+01 N	6.10E+04 N	2.30E+03 N		0.00E+00	0.00E+00		
Maneb	1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N		0.00E+00	0.00E+00		
Manganese and compounds	8.40E+02 N	5.20E-02 N	3.10E+01 N	4.70E+04 N	1.80E+03 N		0.00E+00	0.00E+00		
Mephosfolan	3.30E+00 N	3.30E-01 N	1.20E-01 N	1.80E+02 N	7.00E+00 N		0.00E+00	0.00E+00		
Mepiquat chloride	1.10E+03 N	1.10E+02 N	4.10E+01 N	6.10E+04 N	2.30E+03 N		0.00E+00	0.00E+00		
Mercuric chloride	1.10E+01 N	1.10E+00 N	4.10E-01 N	6.10E+02 N	2.30E+01 N		0.00E+00	0.00E+00		
Mercury (inorganic)	1.10E+01 N	3.10E-01 N	4.10E-01 N	6.10E+02 N	2.30E+01 N		7.00E+00 B	3.00E+00 B		
Mercury (methyl)	3.70E+00 N	3.70E-01 N	1.40E-01 N	2.00E+02 N	7.80E+00 N		0.00E+00	0.00E+00		
Merphos	1.10E+00 N	1.10E-01 N	4.10E-02 N	6.10E+01 N	2.30E+00 N		0.00E+00	0.00E+00		
Merphos oxide	1.10E+00 N	1.10E-01 N	4.10E-02 N	6.10E+01 N	2.30E+00 N		0.00E+00	0.00E+00		
Metalaxyl	2.20E+03 N	2.20E+02 N	8.10E+01 N	1.20E+05 N	4.70E+03 N		0.00E+00	0.00E+00		
Methacrylonitrile	3.70E+00 N	7.30E-01 N	1.40E-01 N	2.00E+02 N	7.80E+00 N		0.00E+00	0.00E+00		
Methamidophos	1.80E+00 N	1.80E-01 N	6.80E-02 N	1.00E+02 N	3.90E+00 N		0.00E+00	0.00E+00		
Methanol	1.80E+04 N	1.80E+03 N	6.80E+02 N	1.00E+06 N	3.90E+04 N		0.00E+00	0.00E+00		
Methidathion	3.70E+01 N	3.70E+00 N	1.40E+00 N	2.00E+03 N	7.80E+01 N		0.00E+00	0.00E+00		
Methomyl	9.10E+02 N	9.10E+01 N	3.40E+01 N	5.10E+04 N	2.00E+03 N		0.00E+00	0.00E+00		
Methoxychlor	1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N		4.10E+01 S	6.20E+01 B		
2-Methoxyethanol acetate	7.30E+01 N	7.30E+00 N	2.70E+00 N	4.10E+03 N	1.60E+02 N		0.00E+00	0.00E+00		
2-Methoxyethanol	3.70E+01 N	2.10E+01 N	1.40E+00 N	2.00E+03 N	7.80E+01 N		0.00E+00	0.00E+00		
2-Methoxy-5-nitroaniline	1.50E+00 C	1.40E-01 C	6.90E-02 C	1.20E+02 C	1.40E+01 C		0.00E+00	0.00E+00		

Table 3-2
EPA Region III Risk Based Concentrations

Contaminant	Basis : C=carcinogenic effects N=noncarcinogenic effects E=EPA draft Soil Screening Level S=soil saturation concentration M=EPA MCL.							
	Risk-Based Concentrations						Soil Screening Levels- Transfers from Soil to:	
	Tap Water µg/L	Ambient Air µg/m ³	Fish mg/kg	Soil Ingestion			Air mg/kg	Groundwater mg/kg
				Industrial mg/kg	Residential mg/kg			
Methyl acetate	3.70E+04 N	3.70E+03 N	1.40E+03 N	1.00E+06 N	7.80E+04 N		0.00E+00	0.00E+00
Methyl acrylate	1.10E+03 N	1.10E+02 N	4.10E+01 N	6.10E+04 N	2.30E+03 N		0.00E+00	0.00E+00
2-Methylaniline hydrochloride	3.70E-01 C	3.50E-02 C	1.80E-02 C	3.20E+01 C	3.50E+00 C		0.00E+00	0.00E+00
2-Methylaniline	2.80E-01 C	2.60E-02 C	1.30E-02 C	2.40E+01 C	2.70E+00 C		0.00E+00	0.00E+00
Methyl chlorocarbonate	3.70E+04 N	3.70E+03 N	1.40E+03 N	1.00E+06 N	7.80E+04 N		0.00E+00	0.00E+00
4-(2-Methyl-4-chlorophenoxy) butyric acid	3.70E+02 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N		0.00E+00	0.00E+00
2-Methyl-4-chlorophenoxyacetic acid	1.80E+01 N	1.80E+00 N	6.80E-01 N	1.00E+03 N	3.90E+01 N		0.00E+00	0.00E+00
2-(2-Methyl-14-chlorophenoxy)propionic acid	3.70E+01 N	3.70E+00 N	1.40E+00 N	2.00E+03 N	7.80E+01 N		0.00E+00	0.00E+00
Methylcyclohexane	3.10E+04 N	3.10E+03 N	0.00E+00	0.00E+00	0.00E+00		6.00E+01 S	1.50E+03 N
Methylene bromide	6.10E+01 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N		0.00E+00	0.00E+00
Methylene chloride	4.10E+00 C	3.80E+00 C	4.20E-01 C	7.60E+02 C	8.50E+01 C		7.00E+00 B	1.00E-02 E
4,4'-Methylene bis(2-chloroaniline)	5.20E-01 C	4.80E-02 C	2.40E-02 C	4.40E+01 C	4.90E+00 C		0.00E+00	0.00E+00
4,4'-Methylenebisbenzeneamine	2.70E-01 C	2.50E-02 C	1.30E-02 C	2.30E+01 C	2.60E+00 C		0.00E+00	0.00E+00
4,4'-Methylene bis(N,N'-dimethyl)aniline	1.50E+00 C	1.40E-01 C	6.90E-02 C	1.20E+02 C	1.40E+01 C		0.00E+00	0.00E+00
4,4'-Methylenediphenyl isocyanate	3.50E-02 N	2.10E-02 N	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00
Methyl ethyl ketone	1.90E+03 N	1.00E+03 N	8.10E+02 N	1.00E+06 N	4.70E+04 N		0.00E+00	0.00E+00
Methyl hydrazine	6.10E-02 C	5.70E-03 C	2.90E-03 C	5.20E+00 C	5.80E-01 C		0.00E+00	0.00E+00
Methyl isobutyl ketone	2.90E+03 N	8.40E+01 N	1.10E+02 N	1.60E+05 N	6.30E+03 N		0.00E+00	0.00E+00
Methyl methacrylate	2.90E+03 N	2.90E+02 N	1.10E+02 N	1.60E+05 N	6.30E+03 N		0.00E+00	0.00E+00
2-Methyl-5-nitroaniline	2.00E+00 C	1.90E-01 C	9.60E-02 C	1.70E+02 C	1.90E+01 C		0.00E+00	0.00E+00
Methyl parathion	9.10E+00 N	9.10E-01 N	3.40E-01 N	5.10E+02 N	2.00E+01 N		2.80E+01 S	4.10E-02 N
2-Methylphenol (o-cresol)	1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N		1.20E+04 S	6.00E+00 B
3-Methylphenol (m-cresol)	1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N		0.00E+00	0.00E+00
4-Methylphenol (p-cresol)	1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N		0.00E+00	0.00E+00
Methyl styrene (mixture)	6.00E+01 N	4.20E+01 N	8.10E+00 N	1.20E+04 N	4.70E+02 N		1.00E+02 N	1.00E+00 N
Methyl styrene (alpha)	4.30E+02 N	2.60E+02 N	9.50E+01 N	1.40E+05 N	5.50E+03 N		8.80E+00 S	7.50E+00 N
Methyl tertbutyl ether (MTBE)	1.80E+02 N	3.10E+03 N	6.80E+00 N	1.00E+04 N	3.90E+02 N		0.00E+00	0.00E+00
Metolaclor (Dual)	5.50E+03 N	5.50E+02 N	2.00E+02 N	3.10E+05 N	1.20E+04 N		0.00E+00	0.00E+00
Metribuzin	9.10E+02 N	9.10E+01 N	3.40E+01 N	5.10E+04 N	2.00E+03 N		0.00E+00	0.00E+00
Mirex	3.70E-02 C	3.50E-03 C	1.80E-03 C	3.20E+00 C	3.50E-01 C		0.00E+00	0.00E+00
Molinate	7.30E+01 N	7.30E+00 N	2.70E+00 N	4.10E+03 N	1.60E+02 N		0.00E+00	0.00E+00
Molybdenum	1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N		0.00E+00	0.00E+00
Monochloramine	3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N		0.00E+00	0.00E+00
Naled	7.30E+01 N	7.30E+00 N	2.70E+00 N	4.10E+03 N	1.60E+02 N		0.00E+00	0.00E+00
2-Naphthylamine	5.20E-04 C	4.80E-05 C	2.40E-05 C	4.40E-02 C	4.90E-03 C		0.00E+00	0.00E+00
Napropamide	3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N		0.00E+00	0.00E+00

Table 3-2
EPA Region III Risk Based Concentrations

Contaminant	Basis : C=carcinogenic effects N=noncarcinogenic effects E=EPA draft Soil Screening Level													
	S=soil saturation concentration M=EPA MCL.													
	Risk-Based Concentrations							Soil Screening Levels- Transfers from Soil to:						
	Tap Water µg/L	Ambient Air µg/m3	Fish mg/kg	Soil Ingestion										
Industrial mg/kg				Residential mg/kg	Air mg/kg	Groundwater mg/kg								
Nickel refinery dust	0.00E+00	7.50E-03	C	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00					
Nickel and compounds	7.30E+02	N	7.30E+01	N	2.70E+01	N	4.10E+04	N	1.60E+03	N	6.90E+03	E	2.10E+01	E
Nickel subsulfide	0.00E+00		3.70E-03	C	0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00	
Nitrapyrin	5.50E+01	N	5.50E+00	N	2.00E+00	N	3.10E+03	N	1.20E+02	N	0.00E+00		0.00E+00	
Nitrate	5.80E+04	N	5.80E+03	N	2.20E+03	N	1.00E+06	N	1.30E+05	N	0.00E+00		0.00E+00	
Nitric oxide	3.70E+03	N	3.70E+02	N	1.40E+02	N	2.00E+05	N	7.80E+03	N	0.00E+00		0.00E+00	
Nitrite	3.70E+03	N	3.70E+02	N	1.40E+02	N	2.00E+05	N	7.80E+03	N	0.00E+00		0.00E+00	
2-Nitroaniline	2.20E+00	N	2.10E-01	N	8.10E-02	N	1.20E+02	N	4.70E+00	N	0.00E+00		0.00E+00	
3-Nitroaniline	1.10E+02	N	1.10E+01	N	4.10E+00	N	6.10E+03	N	2.30E+02	N	0.00E+00		0.00E+00	
4-Nitroaniline	1.10E+02	N	1.10E+01	N	4.10E+00	N	6.10E+03	N	2.30E+02	N	0.00E+00		0.00E+00	
Nitrobenzene	3.40E+00	N	2.10E+00	N	6.80E-01	N	1.00E+03	N	3.90E+01	N	1.10E+02	E	9.00E-02	E
Nitrofurantoin	2.60E+03	N	2.60E+02	N	9.50E+01	N	1.40E+05	N	5.50E+03	N	0.00E+00		0.00E+00	
Nitrofurazone	4.50E-02	C	6.70E-04	C	2.10E-03	C	3.80E+00	C	4.30E-01	C	0.00E+00		0.00E+00	
Nitrogen dioxide	3.70E+04	N	3.70E+03	N	1.40E+03	N	1.00E+06	N	7.80E+04	N	0.00E+00		0.00E+00	
Nitroguanidine	3.70E+03	N	3.70E+02	N	1.40E+02	N	2.00E+05	N	7.80E+03	N	0.00E+00		0.00E+00	
4-Nitrophenol	2.30E+03	N	2.30E+02	N	8.40E+01	N	1.30E+05	N	4.80E+03	N	0.00E+00		0.00E+00	
2-Nitropropane	2.10E+02	N	6.70E-04	C	0.00E+00		0.00E+00		0.00E+00		0.00E+00		0.00E+00	
N-Nitrosodi-n-butylamine	1.20E-02	C	1.10E-03	C	5.80E-04	C	1.10E+00	C	1.20E-01	C	0.00E+00		0.00E+00	
N-Nitrosodiethanolamine	2.40E-02	C	2.20E-03	C	1.10E-03	C	2.00E+00	C	2.30E-01	C	0.00E+00		0.00E+00	
N-Nitrosodiethylamine	4.50E-04	C	4.10E-05	C	2.10E-05	C	3.80E-02	C	4.30E-03	C	0.00E+00		0.00E+00	
N-Nitrosodimethylamine	1.30E-03	C	1.30E-04	C	6.20E-05	C	1.10E-01	C	1.30E-02	C	0.00E+00		0.00E+00	
N-Nitrosodiphenylamine	1.40E+01	C	1.30E+00	C	6.40E-01	C	1.20E+03	C	1.30E+02	C	2.90E+01	C	2.00E-01	
N-Nitroso di-n-propylamine	9.60E-03	C	8.90E-04	C	4.50E-04	C	8.20E-01	C	9.10E-02	C	1.40E-02	C	2.00E-05	
N-Nitroso-N-methylethylamine	3.10E-03	C	2.80E-04	C	1.40E-04	C	2.60E-01	C	2.90E-02	C	0.00E+00		0.00E+00	
N-Nitrosopyrrolidine	3.20E-02	C	2.90E-03	C	1.50E-03	C	2.70E+00	C	3.00E-01	C	0.00E+00		0.00E+00	
m-Nitrotoluene	6.10E+01	N	3.70E+01	N	1.40E+01	N	2.00E+04	N	7.80E+02	N	4.60E+02	S	4.20E-01	
o-Nitrotoluene	6.10E+01	N	3.70E+01	N	1.40E+01	N	2.00E+04	N	7.80E+02	N	4.60E+02	S	4.20E-01	
p-Nitrotoluene	6.10E+01	N	3.70E+01	N	1.40E+01	N	2.00E+04	N	7.80E+02	N	4.60E+02	S	4.20E-01	
Norflurazon	1.50E+03	N	1.50E+02	N	5.40E+01	N	8.20E+04	N	3.10E+03	N	0.00E+00		0.00E+00	
NuStar	2.60E+01	N	2.60E+00	N	9.50E-01	N	1.40E+03	N	5.50E+01	N	0.00E+00		0.00E+00	
Octabromodiphenyl ether	1.10E+02	N	1.10E+01	N	4.10E+00	N	6.10E+03	N	2.30E+02	N	0.00E+00		0.00E+00	
Octahydro-1357-tetranitro-1357-tetrazocine	1.80E+03	N	1.80E+02	N	6.80E+01	N	1.00E+05	N	3.90E+03	N	0.00E+00		0.00E+00	
Octamethylpyrophosphoramidate	7.30E+01	N	7.30E+00	N	2.70E+00	N	4.10E+03	N	1.60E+02	N	0.00E+00		0.00E+00	
Oryzalin	1.80E+03	N	1.80E+02	N	6.80E+01	N	1.00E+05	N	3.90E+03	N	0.00E+00		0.00E+00	
Oxadiazon	1.80E+02	N	1.80E+01	N	6.80E+00	N	1.00E+04	N	3.90E+02	N	0.00E+00		0.00E+00	
Oxamyl	9.10E+02	N	9.10E+01	N	3.40E+01	N	5.10E+04	N	2.00E+03	N	0.00E+00		0.00E+00	

Table 3-2
EPA Region III Risk Based Concentrations

Contaminant	Basis : C=carcinogenic effects N=noncarcinogenic effects E=EPA draft Soil Screening Level S=soil saturation concentration M=EPA MCL.									
	Risk-Based Concentrations						Soil Screening Levels- Transfers from Soil to:			
	Tap Water µg/L		Ambient Air µg/m3		Fish mg/kg		Soil Ingestion		Air mg/kg	Groundwater mg/kg
							Industrial mg/kg	Residential mg/kg		
Oxyfluorfen	1.10E+02	N	1.10E+01	N	4.10E+00	N	6.10E+03	2.30E+02	0.00E+00	0.00E+00
Paclobutrazol	4.70E+02	N	4.70E+01	N	1.80E+01	N	2.70E+04	1.00E+03	0.00E+00	0.00E+00
Paraquat	1.60E+02	N	1.60E+01	N	6.10E+00	N	9.20E+03	3.50E+02	0.00E+00	0.00E+00
Parathion	2.20E+02	N	2.20E+01	N	8.10E+00	N	1.20E+04	4.70E+02	1.10E+02	3.90E+00
Pebulate	1.80E+03	N	1.80E+02	N	6.80E+01	N	1.00E+05	3.90E+03	0.00E+00	0.00E+00
Pendimethalin	1.50E+03	N	1.50E+02	N	5.40E+01	N	8.20E+04	3.10E+03	0.00E+00	0.00E+00
Pentabromo-6-chloro cyclohexane	2.90E+00	C	2.70E-01	C	1.40E-01	C	2.50E+02	2.80E+01	0.00E+00	0.00E+00
Pentabromodiphenyl ether	7.30E+01	N	7.30E+00	N	2.70E+00	N	4.10E+03	1.60E+02	0.00E+00	0.00E+00
Pentachlorobenzene	4.90E+00	N	2.90E+00	N	1.10E+00	N	1.60E+03	6.30E+01	5.70E+02	4.80E+01
Pentachloronitrobenzene	4.10E-02	C	2.40E-02	C	1.20E-02	C	2.20E+01	2.50E+00	0.00E+00	0.00E+00
Pentachlorophenol	5.60E-01	C	5.20E-02	C	2.60E-02	C	4.80E+01	5.30E+00	7.90E+00	2.00E-01
Permethrin	1.80E+03	N	1.80E+02	N	6.80E+01	N	1.00E+05	3.90E+03	0.00E+00	0.00E+00
Phenmedipham	9.10E+03	N	9.10E+02	N	3.40E+02	N	5.10E+05	2.00E+04	0.00E+00	0.00E+00
Phenol	2.20E+04	N	2.20E+03	N	8.10E+02	N	1.00E+06	4.70E+04	2.10E+04	4.90E+01
m-Phenylenediamine	2.20E+02	N	2.20E+01	N	8.10E+00	N	1.20E+04	4.70E+02	0.00E+00	0.00E+00
p-Phenylenediamine	6.90E+03	N	6.90E+02	N	2.60E+02	N	3.90E+05	1.50E+04	0.00E+00	0.00E+00
Phenylmercuric acetate	2.90E+00	N	2.90E-01	N	1.10E-01	N	1.60E+02	6.30E+00	0.00E+00	0.00E+00
2-Phenylphenol	3.50E+01	C	3.20E+00	C	1.60E+00	C	3.00E+03	3.30E+02	0.00E+00	0.00E+00
Phorate	7.30E+00	N	7.30E-01	N	2.70E-01	N	4.10E+02	1.60E+01	0.00E+00	0.00E+00
Phosmet	7.30E+02	N	7.30E+01	N	2.70E+01	N	4.10E+04	1.60E+03	0.00E+00	0.00E+00
Phosphine	1.10E+01	N	3.10E-01	N	4.10E-01	N	6.10E+02	2.30E+01	0.00E+00	0.00E+00
Phosphoric acid	1.00E+02	N	1.00E+01	N	0.00E+00		0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphorus (white)	7.30E-01	N	7.30E-02	N	2.70E-02	N	4.10E+01	1.60E+00	0.00E+00	0.00E+00
p-Phthalic acid	3.70E+04	N	3.70E+03	N	1.40E+03	N	1.00E+06	7.80E+04	0.00E+00	0.00E+00
Phthalic anhydride	7.30E+04	N	1.30E+02	N	2.70E+03	N	1.00E+06	1.60E+05	0.00E+00	0.00E+00
Picloram	2.60E+03	N	2.60E+02	N	9.50E+01	N	1.40E+05	5.50E+03	0.00E+00	0.00E+00
Pirimiphos-methyl	3.70E+02	N	3.70E+01	N	1.40E+01	N	2.00E+04	7.80E+02	0.00E+00	0.00E+00
Polybrominated biphenyls	7.60E-03	C	7.00E-04	C	3.50E-04	C	6.40E-01	7.20E-02	0.00E+00	0.00E+00
**Polychlorinated biphenyls (PCBs)	3.35E-02	C	3.13E-03	C	1.60E-03	C	2.86E+00	3.19E-01	0.00E+00	0.00E+00
Aroclor 1016	2.60E+00	N	2.60E-01	N	9.50E-02	N	1.40E+02	5.50E+00	0.00E+00	0.00E+00
Aroclor 1254	7.30E-01	N	7.30E-02	N	2.70E-02	N	4.10E+01	1.60E+00	0.00E+00	0.00E+00
Polychlorinated terphenyls (PCTs)	1.50E-02	C	1.40E-03	C	7.00E-04	C	1.30E+00	1.40E-01	0.00E+00	0.00E+00
Polynuclear aromatic hydrocarbons	0.00E+00		0.00E+00		0.00E+00		0.00E+00	0.00E+00	1.10E+05	0.00E+00
Acenaphthene	2.20E+03	N	2.20E+02	N	8.10E+01	N	1.20E+05	4.70E+03	1.20E+02	2.00E+02
Anthracene	1.10E+04	N	1.10E+03	N	4.10E+02	N	6.10E+05	2.30E+04	6.80E+00	4.30E+03
Benz[a]anthracene	9.20E-02	C	1.00E-02	C	4.30E-03	C	7.80E+00	8.80E-01	2.70E+01	7.00E-01

Table 3-2
EPA Region III Risk Based Concentrations

Contaminant	Basis : C=carcinogenic effects N=noncarcinogenic effects E=EPA draft Soil Screening Level S=soil saturation concentration M=EPA MCL.									
	Risk-Based Concentrations						Soil Screening Levels- Transfers from Soil to:			
	Tap Water µg/L	Ambient Air µg/m3	Fish mg/kg	Soil Ingestion						
				Industrial mg/kg	Residential mg/kg	Air mg/kg	Groundwater mg/kg			
Benzo[b]fluoranthene	9.20E-02 c	1.00E-02 c	4.30E-03 c	7.80E+00 c	8.80E-01 c	2.30E+01 s	4.00E+00 B			
Benzo[k]fluoranthene	9.20E-01 c	1.00E-01 c	4.30E-02 c	7.80E+01 c	8.80E+00 c	0.00E+00	4.00E+00 B			
Benzo[a]pyrene	9.20E-03 c	1.00E-03 c	4.30E-04 c	7.80E-01 c	8.80E-02 c	1.10E+01 s	4.00E+00 B			
Carbazole	3.40E+00 c	3.10E-01 c	1.60E-01 c	2.90E+02 c	3.20E+01 c	1.10E+01 s	5.00E-01 B			
Chrysene	9.20E+00 c	1.00E+00 c	4.30E-01 c	7.80E+02 c	8.80E+01 c	3.60E+00 s	1.00E+00 B			
Dibenz[ah]anthracene	9.20E-03 c	1.00E-03 c	4.30E-04 c	7.80E-01 c	8.80E-02 c	7.20E+00 s	1.10E+01 B			
Fluoranthene	1.50E+03 N	1.50E+02 N	5.40E+01 N	8.20E+04 N	3.10E+03 N	6.80E+01 s	9.80E+02 B			
Fluorene	1.50E+03 N	1.50E+02 N	5.40E+01 N	8.20E+04 N	3.10E+03 N	8.90E+01 s	1.60E+02 B			
Indeno[1,2,3-cd]pyrene	9.20E-02 c	1.00E-02 c	4.30E-03 c	7.80E+00 c	8.80E-01 c	2.80E+02 s	3.50E+01 B			
Naphthalene	1.50E+03 N	1.50E+02 N	5.40E+01 N	8.20E+04 N	3.10E+03 N	1.80E+02 s	3.00E+01 B			
Pyrene	1.10E+03 N	1.10E+02 N	4.10E+01 N	6.10E+04 N	2.30E+03 N	5.60E+01 s	1.40E+03 B			
Prochloraz	4.50E-01 c	4.20E-02 c	2.10E-02 c	3.80E+01 c	4.30E+00 c	0.00E+00	0.00E+00			
Profluralin	2.20E+02 N	2.20E+01 N	8.10E+00 N	1.20E+04 N	4.70E+02 N	0.00E+00	0.00E+00			
Prometon	5.50E+02 N	5.50E+01 N	2.00E+01 N	3.10E+04 N	1.20E+03 N	0.00E+00	0.00E+00			
Prometryn	1.50E+02 N	1.50E+01 N	5.40E+00 N	8.20E+03 N	3.10E+02 N	0.00E+00	0.00E+00			
Pronamide	2.70E+03 N	2.70E+02 N	1.00E+02 N	1.50E+05 N	5.90E+03 N	0.00E+00	0.00E+00			
Propachlor	4.70E+02 N	4.70E+01 N	1.80E+01 N	2.70E+04 N	1.00E+03 N	0.00E+00	0.00E+00			
Propanil	1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N	0.00E+00	0.00E+00			
Propargite	7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N	0.00E+00	0.00E+00			
Propargyl alcohol	7.30E+01 N	7.30E+00 N	2.70E+00 N	4.10E+03 N	1.60E+02 N	0.00E+00	0.00E+00			
Propazine	7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N	0.00E+00	0.00E+00			
Propham	7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N	0.00E+00	0.00E+00			
Propiconazole	4.70E+02 N	4.70E+01 N	1.80E+01 N	2.70E+04 N	1.00E+03 N	0.00E+00	0.00E+00			
Propylene glycol	7.30E+05 N	7.30E+04 N	2.70E+04 N	1.00E+06 N	1.00E+06 N	0.00E+00	0.00E+00			
Propylene glycol, monoethyl ether	2.60E+04 N	2.60E+03 N	9.50E+02 N	1.00E+06 N	5.50E+04 N	0.00E+00	0.00E+00			
Propylene glycol, monomethyl ether	2.60E+04 N	2.10E+03 N	9.50E+02 N	1.00E+06 N	5.50E+04 N	0.00E+00	0.00E+00			
Propylene oxide	2.80E-01 c	4.90E-01 c	1.30E-02 c	2.40E+01 c	2.70E+00 c	0.00E+00	0.00E+00			
Pursuit	9.10E+03 N	9.10E+02 N	3.40E+02 N	5.10E+05 N	2.00E+04 N	0.00E+00	0.00E+00			
Pydrin	9.10E+02 N	9.10E+01 N	3.40E+01 N	5.10E+04 N	2.00E+03 N	0.00E+00	0.00E+00			
Pyridine	3.70E+01 N	3.70E+00 N	1.40E+00 N	2.00E+03 N	7.80E+01 N	0.00E+00	0.00E+00			
Quinalphos	1.80E+01 N	1.80E+00 N	6.80E-01 N	1.00E+03 N	3.90E+01 N	0.00E+00	0.00E+00			
Quinoline	5.60E-03 c	5.20E-04 c	2.60E-04 c	4.80E-01 c	5.30E-02 c	0.00E+00	0.00E+00			
Resmethrin	1.10E+03 N	1.10E+02 N	4.10E+01 N	6.10E+04 N	2.30E+03 N	0.00E+00	0.00E+00			
Ronnel	1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N	0.00E+00	0.00E+00			
Rotenone	1.50E+02 N	1.50E+01 N	5.40E+00 N	8.20E+03 N	3.10E+02 N	0.00E+00	0.00E+00			
Savey	9.10E+02 N	9.10E+01 N	3.40E+01 N	5.10E+04 N	2.00E+03 N	0.00E+00	0.00E+00			

Table 3-2
EPA Region III Risk Based Concentrations

Contaminant	Basis : C=carcinogenic effects N=noncarcinogenic effects E=EPA draft Soil Screening Level S=soil saturation concentration M=EPA MCL.									
	Risk-Based Concentrations						Soil Screening Levels- Transfers from Soil to:			
	Tap Water µg/L	N	Ambient Air µg/m3	N	Fish mg/kg	N	Soil Ingestion		Air mg/kg	Groundwater mg/kg
							Industrial mg/kg	Residential mg/kg		
Selenious Acid	1.80E+02	N	1.80E+01	N	6.80E+00	N	1.00E+04	N 3.90E+02	N 0.00E+00	0.00E+00
Selenium	1.80E+02	N	1.80E+01	N	6.80E+00	N	1.00E+04	N 3.90E+02	N 0.00E+00	3.00E+00 E
Selenourea	1.80E+02	N	1.80E+01	N	6.80E+00	N	1.00E+04	N 3.90E+02	N 0.00E+00	0.00E+00
Sethoxydim	3.30E+03	N	3.30E+02	N	1.20E+02	N	1.80E+05	N 7.00E+03	N 0.00E+00	0.00E+00
Silver and compounds	1.80E+02	N	1.80E+01	N	6.80E+00	N	1.00E+04	N 3.90E+02	N 0.00E+00	0.00E+00
Simazine	5.60E-01	C	5.20E-02	C	2.60E-02	C	4.80E+01	C 5.30E+00	C 0.00E+00	0.00E+00
Sodium azide	1.50E+02	N	1.50E+01	N	5.40E+00	N	8.20E+03	N 3.10E+02	N 0.00E+00	0.00E+00
Sodium diethyldithiocarbamate	2.50E-01	C	2.30E-02	C	1.20E-02	C	2.10E+01	C 2.40E+00	C 0.00E+00	0.00E+00
Sodium fluoroacetate	7.30E-01	N	7.30E-02	N	2.70E-02	N	4.10E+01	N 1.60E+00	N 0.00E+00	0.00E+00
Sodium metavanadate	3.70E+01	N	3.70E+00	N	1.40E+00	N	2.00E+03	N 7.80E+01	N 0.00E+00	0.00E+00
Strontium, stable	2.20E+04	N	2.20E+03	N	8.10E+02	N	1.00E+06	N 4.70E+04	N 0.00E+00	0.00E+00
Strychnine	1.10E+01	N	1.10E+00	N	4.10E-01	N	6.10E+02	N 2.30E+01	N 0.00E+00	0.00E+00
Styrene	1.60E+03	N	1.00E+03	N	2.70E+02	N	4.10E+05	N 1.60E+04	N 1.40E+03 E	2.00E+00 E
Systhane	9.10E+02	N	9.10E+01	N	3.40E+01	N	5.10E+04	N 2.00E+03	N 0.00E+00	0.00E+00
2,3,7,8-TCDD (dioxin)	4.30E-07	C	5.40E-08	C	0.00E+00	C	3.70E-05	C 4.10E-06	C 0.00E+00	0.00E+00
Tebuthiuron	2.60E+03	N	2.60E+02	N	9.50E+01	N	1.40E+05	N 5.50E+03	N 0.00E+00	0.00E+00
Temephos	7.30E+02	N	7.30E+01	N	2.70E+01	N	4.10E+04	N 1.60E+03	N 0.00E+00	0.00E+00
Terbacil	4.70E+02	N	4.70E+01	N	1.80E+01	N	2.70E+04	N 1.00E+03	N 0.00E+00	0.00E+00
Terbufos	9.10E-01	N	9.10E-02	N	3.40E-02	N	5.10E+01	N 2.00E+00	N 0.00E+00	0.00E+00
Terbutryn	3.70E+01	N	3.70E+00	N	1.40E+00	N	2.00E+03	N 7.80E+01	N 0.00E+00	0.00E+00
1,2,4,5-Tetrachlorobenzene	1.80E+00	N	1.10E+00	N	4.10E-01	N	6.10E+02	N 2.30E+01	N 9.10E+01 N	6.90E-01 N
1,1,1,2-Tetrachloroethane	4.10E-01	C	2.40E-01	C	1.20E-01	C	2.20E+02	C 2.50E+01	C 0.00E+00	0.00E+00
1,1,2,2-Tetrachloroethane	5.20E-02	C	3.10E-02	C	1.60E-02	C	2.90E+01	C 3.20E+00	C 4.00E-01 B	1.00E-03 B
Tetrachloroethylene (PCE)	1.10E+00	C	3.10E+00	C	6.10E-02	C	1.10E+02	C 1.20E+01	C 1.10E+01 B	4.00E-02 B
2,3,4,6-Tetrachlorophenol	1.10E+03	N	1.10E+02	N	4.10E+01	N	6.10E+04	N 2.30E+03	N 0.00E+00	0.00E+00
p,a,a,a-Tetrachlorotoluene	5.30E-04	C	3.10E-04	C	1.60E-04	C	2.90E-01	C 3.20E-02	C 0.00E+00	0.00E+00
Tetrachlorovinphos	2.80E+00	C	2.60E-01	C	1.30E-01	C	2.40E+02	C 2.70E+01	C 0.00E+00	0.00E+00
Tetraethyldithiopyrophosphate	1.80E+01	N	1.80E+00	N	6.80E-01	N	1.00E+03	N 3.90E+01	N 0.00E+00	0.00E+00
Tetraethyl lead	3.70E-03	N	3.70E-04	N	1.40E-04	N	2.00E-01	N 7.80E-03	N 6.80E-04 N	3.40E-05 N
1,1,1,2-Tetrafluoroethane	1.40E+05	N	8.40E+04	N	0.00E+00		0.00E+00	0.00E+00	0.00E+00	0.00E+00
Thallic oxide	2.60E+00	N	2.60E-01	N	9.50E-02	N	1.40E+02	N 5.50E+00	N 0.00E+00	0.00E+00
Thallium	0.00E+00		0.00E+00		0.00E+00		0.00E+00	0.00E+00	0.00E+00	4.00E-01 E
Thallium acetate	3.30E+00	N	3.30E-01	N	1.20E-01	N	1.80E+02	N 7.00E+00	N 0.00E+00	0.00E+00
Thallium carbonate	2.90E+00	N	2.90E-01	N	1.10E-01	N	1.60E+02	N 6.30E+00	N 0.00E+00	0.00E+00
Thallium chloride	2.90E+00	N	2.90E-01	N	1.10E-01	N	1.60E+02	N 6.30E+00	N 0.00E+00	0.00E+00
Thallium nitrate	3.30E+00	N	3.30E-01	N	1.20E-01	N	1.80E+02	N 7.00E+00	N 0.00E+00	0.00E+00

Table 3-2
EPA Region III Risk Based Concentrations

Contaminant	Basis : C=carcinogenic effects N=noncarcinogenic effects E=EPA draft Soil Screening Level S=soil saturation concentration M=EPA MCL.									
	Risk-Based Concentrations							Soil Screening Levels- Transfers from Soil to:		
	Tap Water µg/L	Ambient Air µg/m3	Fish mg/kg	Soil Ingestion		Air mg/kg	Groundwater mg/kg			
				Industrial mg/kg	Residential mg/kg					
Thallium selenite	3.30E+00 N	3.30E-01 N	1.20E-01 N	1.80E+02 N	7.00E+00 N	0.00E+00	0.00E+00			
Thallium sulfate	2.90E+00 N	2.90E-01 N	1.10E-01 N	1.60E+02 N	6.30E+00 N	0.00E+00	0.00E+00			
Thiobencarb	3.70E+02 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N	0.00E+00	0.00E+00			
2-(Thiocyanomethylthio)-benzothiazole	1.10E+03 N	1.10E+02 N	4.10E+01 N	6.10E+04 N	2.30E+03 N	0.00E+00	0.00E+00			
Thiofanox	1.10E+01 N	1.10E+00 N	4.10E-01 N	6.10E+02 N	2.30E+01 N	0.00E+00	0.00E+00			
Thiophanate-methyl	2.90E+03 N	2.90E+02 N	1.10E+02 N	1.60E+05 N	6.30E+03 N	0.00E+00	0.00E+00			
Thiram	1.80E+02 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N	0.00E+00	0.00E+00			
Tin and compounds	2.20E+04 N	2.20E+03 N	8.10E+02 N	1.00E+06 N	4.70E+04 N	0.00E+00	0.00E+00			
Toluene	7.50E+02 N	4.20E+02 N	2.70E+02 N	4.10E+05 N	1.60E+04 N	5.20E+02 E	5.00E+00 E			
Toluene-2,4-diamine	2.10E-02 C	2.00E-03 C	9.90E-04 C	1.80E+00 C	2.00E-01 C	0.00E+00	0.00E+00			
Toluene-2,5-diamine	2.20E+04 N	2.20E+03 N	8.10E+02 N	1.00E+06 N	4.70E+04 N	0.00E+00	0.00E+00			
Toluene-2,6-diamine	7.30E+03 N	7.30E+02 N	2.70E+02 N	4.10E+05 N	1.60E+04 N	0.00E+00	0.00E+00			
p-Toluidine	3.50E-01 C	3.30E-02 C	1.70E-02 C	3.00E+01 C	3.40E+00 C	0.00E+00	0.00E+00			
Toxaphene	6.10E-02 C	5.60E-03 C	2.90E-03 C	5.20E+00 C	5.80E-01 C	5.00E+00 E	4.00E-02 E			
Tralomethrin	2.70E+02 N	2.70E+01 N	1.00E+01 N	1.50E+04 N	5.90E+02 N	0.00E+00	0.00E+00			
Triallate	4.70E+02 N	4.70E+01 N	1.80E+01 N	2.70E+04 N	1.00E+03 N	0.00E+00	0.00E+00			
Triasulfuron	3.70E+02 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N	0.00E+00	0.00E+00			
1,2,4-Tribromobenzene	3.00E+01 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N	0.00E+00	0.00E+00			
Tributyltin oxide (TBTO)	1.10E+00 N	1.10E-01 N	4.10E-02 N	6.10E+01 N	2.30E+00 N	0.00E+00	0.00E+00			
2,4,6-Trichloroaniline hydrochloride	2.30E+00 C	2.20E-01 C	1.10E-01 C	2.00E+02 C	2.20E+01 C	0.00E+00	0.00E+00			
2,4,6-Trichloroaniline	2.00E+00 C	1.80E-01 C	9.30E-02 C	1.70E+02 C	1.90E+01 C	0.00E+00	0.00E+00			
1,2,4-Trichlorobenzene	1.90E+02 N	2.10E+02 N	1.40E+01 N	2.00E+04 N	7.80E+02 N	2.40E+02 E	2.00E+00 E			
1,1,1-Trichloroethane	7.90E+02 N	1.00E+03 N	4.70E+01 N	7.20E+04 N	2.70E+03 N	9.80E+02 E	9.00E-01 E			
1,1,2-Trichloroethane	1.90E-01 C	1.10E-01 C	5.50E-02 C	1.00E+02 C	1.10E+01 C	8.00E-01 E	1.00E-02 E			
Trichloroethylene (TCE)	1.60E+00 C	1.00E+00 C	2.90E-01 C	5.20E+02 C	5.80E+01 C	3.00E+00 E	2.00E-02 E			
Trichlorofluoromethane	1.30E+03 N	7.30E+02 N	4.10E+02 N	6.10E+05 N	2.30E+04 N	7.90E+02 N	1.30E+01 N			
2,4,5-Trichlorophenol	3.70E+03 N	3.70E+02 N	1.40E+02 N	2.00E+05 N	7.80E+03 N	8.20E+03 S	1.20E+02 E			
2,4,6-Trichlorophenol	6.10E+00 C	5.70E-01 C	2.90E-01 C	5.20E+02 C	5.80E+01 C	1.50E+02 C	6.00E-02 E			
2,4,5-Trichlorophenoxyacetic acid	3.70E+02 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N	0.00E+00	0.00E+00			
2-(2,4,5-Trichlorophenoxy)propionic acid	2.90E+02 N	2.90E+01 N	1.10E+01 N	1.60E+04 N	6.30E+02 N	0.00E+00	0.00E+00			
1,1,2-Trichloropropane	3.00E+01 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N	1.30E+01 N	1.40E-01 N			
1,2,3-Trichloropropane	1.50E-03 C	8.90E-04 C	4.50E-04 C	8.20E-01 C	9.10E-02 C	2.70E-05 C	6.00E-06 C			
1,2,3-Trichloropropene	3.00E+01 N	1.80E+01 N	6.80E+00 N	1.00E+04 N	3.90E+02 N	0.00E+00	0.00E+00			
1,1,2-Trichloro-1,2,2- trifluoroethane	5.90E+04 N	3.10E+04 N	4.10E+04 N	1.00E+06 N	1.00E+06 N	2.40E+03 S	3.10E+03 N			
Tridiphan	1.10E+02 N	1.10E+01 N	4.10E+00 N	6.10E+03 N	2.30E+02 N	0.00E+00	0.00E+00			
Triethylamine	7.30E+01 N	7.30E+00 N	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00			

Table 3-2
EPA Region III Risk Based Concentrations

Contaminant	Basis : C=carcinogenic effects N=noncarcinogenic effects E=EPA draft Soil Screening Level S=soil saturation concentration M=EPA MCL.							
	Risk-Based Concentrations					Soil Screening Levels- Transfers from Soil to:		
	Tap Water µg/L	Ambient Air µg/m3	Fish mg/kg	Soil Ingestion		Air mg/kg	Groundwater mg/kg	
				Industrial mg/kg	Residential mg/kg			
Trifluralin	8.70E+00 C	8.10E-01 C	4.10E-01 C	7.40E+02 C	8.30E+01 C	0.00E+00	0.00E+00	
1,2,4-Trimethylbenzene	3.00E+02 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N	0.00E+00	0.00E+00	
1,3,5-Trimethylbenzene	3.00E+02 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N	9.80E+01 S	2.60E-01 M	
Trimethyl phosphate	1.80E+00 C	1.70E-01 C	8.50E-02 C	1.50E+02 C	1.70E+01 C	0.00E+00	0.00E+00	
1,3,5-Trinitrobenzene	1.80E+00 N	1.80E-01 N	6.80E-02 N	1.00E+02 N	3.90E+00 N	0.00E+00	0.00E+00	
Trinitrophenylmethylnitramine	3.70E+02 N	3.70E+01 N	1.40E+01 N	2.00E+04 N	7.80E+02 N	0.00E+00	0.00E+00	
2,4,6-Trinitrotoluene	2.20E+00 C	2.10E-01 C	1.10E-01 C	1.90E+02 C	2.10E+01 C	0.00E+00	0.00E+00	
Uranium (soluble salts)	1.10E+02 N	1.10E+01 N	4.10E+00 N	6.10E+03 N	2.30E+02 N	0.00E+00	0.00E+00	
Vanadium	2.60E+02 N	2.60E+01 N	9.50E+00 N	1.40E+04 N	5.50E+02 N	0.00E+00	0.00E+00	
Vanadium pentoxide	3.30E+02 N	3.30E+01 N	1.20E+01 N	1.80E+04 N	7.00E+02 N	0.00E+00	0.00E+00	
Vanadium sulfate	7.30E+02 N	7.30E+01 N	2.70E+01 N	4.10E+04 N	1.60E+03 N	0.00E+00	0.00E+00	
Vernam	3.70E+01 N	3.70E+00 N	1.40E+00 N	2.00E+03 N	7.80E+01 N	0.00E+00	0.00E+00	
Vinclozolin	9.10E+02 N	9.10E+01 N	3.40E+01 N	5.10E+04 N	2.00E+03 N	0.00E+00	0.00E+00	
Vinyl acetate	3.70E+04 N	2.10E+02 N	1.40E+03 N	1.00E+06 N	7.80E+04 N	3.70E+02 B	8.40E+01 B	
Vinyl bromide	5.20E+00 N	3.10E+00 N	0.00E+00	0.00E+00	0.00E+00	2.00E+00 N	1.80E-02 N	
Vinyl chloride	1.90E-02 C	2.10E-02 C	1.70E-03 C	3.00E+00 C	3.40E-01 C	2.00E-03 B	1.00E-02 B	
Warfarin	1.10E+01 N	1.10E+00 N	4.10E-01 N	6.10E+02 N	2.30E+01 N	4.60E-02 N	1.80E+03 N	
m-Xylene	1.40E+03 N	7.30E+02 N	2.70E+03 N	1.00E+06 N	1.60E+05 N	9.50E+02 S	2.40E+02 M	
o-Xylene	1.40E+03 N	7.30E+02 N	2.70E+03 N	1.00E+06 N	1.60E+05 N	7.30E+02 S	1.50E+02 M	
p-Xylene	5.20E+02 N	3.10E+02 N	0.00E+00	0.00E+00	0.00E+00	1.00E+03 S	2.20E+02 M	
Xylene (mixed)	1.20E+04 N	7.30E+03 N	2.70E+03 N	1.00E+06 N	1.60E+05 N	3.20E+02 B	7.40E+01 B	
Zinc	1.10E+04 N	1.10E+03 N	4.10E+02 N	6.10E+05 N	2.30E+04 N	0.00E+00	4.20E+04 B	
Zinc phosphide	1.10E+01 N	1.10E+00 N	4.10E-01 N	6.10E+02 N	2.30E+01 N	0.00E+00	0.00E+00	
Zineb	1.80E+03 N	1.80E+02 N	6.80E+01 N	1.00E+05 N	3.90E+03 N	0.00E+00	0.00E+00	

Table 3-3

Proposed NJDEPE Groundwater Cleanup Standards for Class II-A Groundwaters

Parameter	Concentration (mg/L)
Acenaphthene	0.4
Acetone	0.7
Acrylamide	0.000008
Acrylonitrile	0.00006
Aldicarb Sulfone	0.003
Aldrin	0.00004
Alochlor	0.002
Aluminum	0.2
Ammonia	0.5
Anthracene	2.0
Antimony	0.02
Arsenic (Total)	0.008
Atrazine	0.003
Barium	2.0
Benzene	0.001
Benzidine	0.05
Benzyl alcohol	2.0
Beryllium	0.02
alpha-BHC (alpha-HCH)	0.00002
beta-BHC (beta-HCH)	0.0002
gamma-BHC (gamma-HCH/Lindane)	0.0002
Bis (2-chloroethyl) ether	0.01
Bis (2-chlorosopropyl) ether	0.3
Bis (2-ethylhexyl) phthalate	0.03
Bromodichloro-methane	0.001
Bromoform	0.004
2-Butanone (MEK)	0.3
Butylbenzyl phthalates	0.1
Cadmium	0.004
Carbofuran	0.04
Carbon tetrachloride	0.002
Chlordane	0.0005
Chloride	250
Chlorobenzene	0.004
Chloroform	0.006
Chloropyrifos	0.02
2-Chlorophenol	0.04
Chromium (Total)	0.1
Copper	1
Cyanide	0.2

Table 3-3

**Proposed NJDEPE Groundwater Cleanup Standards for Class II-A Groundwaters
(continued)**

Parameter	Concentration (mg/L)
2,4-D	0.07
4,4'-DDD (p,p' TDE)	0.0001
4,4'-DDE	0.0001
4,4'-DDT	0.0001
Dibromochloromethane (Chlorodibromomethane)	0.01
Demeton	0.0003
Di-n-butyl phthalate	0.9
Di-n-octyl phthalate	0.1
1,2-Dichlorobenzene	0.6
1,3-Dichlorobenzene	0.6
1,4-Dichlorobenzene	0.075
3,3'-Dichlorobenzidine	0.06
Dichlorobromomethane	0.001
1,1-Dichloroethane	0.07
1,2-Dichloroethane	0.002
1,1-Dichloroethylene	0.002
1,2-Dichloroethylene (cis)	0.01
1,2-Dichloroethylene (trans)	0.1
2,4-Dichlorophenol	0.02
1,2-Dichloropropane	0.001
Dichloropropane (cis and trans)	0.00002
2,2-Dichloropropionic acid (Dalapon)	0.2
Dieldrin	0.00003
Diethyl phthalate	5.0
2,4-Dimethyl phenol	0.1
Di-n-octyl phthabate	0.1
2,4-Dinitrophenol	0.04
2,4-Dinitrotoluene (2,4-and 2,6-mixture)	0.01
Dinoseb	0.007
1,2-Diphenylhydrazine	0.00004
Diquat	0.02
Endosulfan	0.0004
alpha-Endosulfan (Endosulfan I)	0.0004
beta-Endosulfan (Endosulfan (II))	0.0004
Endosulfan sulfate	0.0004
Endothall	0.1
Endrin	0.002
Epichlorohydrin	0.004

Table 3-3

**Proposed NJDEPE Groundwater Cleanup Standards for Class II-A Groundwaters
(continued)**

Parameter	Concentration (mg/L)
Ethylbenzene	0.7
Ethylene dibromide	0.00005
Fluoranthene	0.3
Fluorene	0.3
Fluoride	2
Heptachlor	0.0004
Heptachlor epoxide	0.0002
Hexachloro-butadiene	0.001
Hexachlorobenzene	0.01
Hexachlorocyclopentadiene	0.05
Hexachloroethane	0.01
Hydrogen sulfide	0.02
Ison	0.3
Isophorone	0.1
Lead (Total)	0.01
Malathion	0.2
Mercury (Total)	0.002
Methoxychlor	0.04
Methyl bromide (bromoethane)	0.01
Methyl chloride (chloromethane)	0.03
4-Methyl-2-pentanone (MIBK)	0.4
Methylene chloride	0.002
Mirex	0.00001
Naphthalene	0.03
Nickel (Soluble salts)	0.1
Nitrate (as N)	10
Nitrate & Nitrite (as N)	10
Nitrite (as N)	1
Nitrobenzene	0.01
N-Nitrosodiphenylamine	0.02
N-Nitrosodimethylamine	0.02
N-Nitrosodi-n-propylamine	0.02
Oxamyl	0.2
PCBs (Polychlorinated biphenyls)	0.0005
Pentachlorophenol	0.001
Phenol	4.0
Piciorum	0.5
Pyrene	0.2

Table 3-3**Proposed NJDEPE Groundwater Cleanup Standards for Class II-A Groundwaters
(continued)**

Parameter	Concentration (mg/L)
Selenium (Total)	0.05
Sodium	50
Sulfate	250
Styrene	0.1
TCDD (2,3,7,8-Tetrachlorodibenzo-p-dioxin)	0.00001
1,1,2,2-Tetrachloroethane	0.002
1,1,1,2-Tetrachloroethane	0.01
Tetrachloroethylene	0.001
Thallium	0.01
Toluene	1.0
Toxaphene	0.003
2,4,5-TP (Silvex)	0.05
1,2,4-Trichlorobenzene	0.009
1,1,1-Trichloroethane	0.03
1,1,2-Trichloroethane	0.003
Trichloroethylene	0.001
2,4,5-Trichlorophenol	0.7
2,4,6-Trichlorophenol	0.02
Vinyl chloride	0.005
Xylenes (Total)	0.04
Zinc	5.0

*Nonpromulgated; officially proposed 3 February 1992

SECTION 4

IDENTIFICATION OF REMOVAL ACTION ALTERNATIVES

Based on the objectives developed in the previous section of this EE/CA, removal actions and technologies that are appropriate for addressing the cleanup objectives are identified in this section. These removal actions and/or technologies, termed response actions in the following subsections, are evaluated based on the removal objectives and, if found appropriate, combined to form alternatives in the subsequent section. In identifying response actions, previous experience with the technologies, as well as knowledge of potential uses of the technologies, were considered. Information from previous investigations conducted at the site was used to determine whether a particular removal action is suitable to the type, quantity, and location of the waste materials.

Alternatives were eliminated if they did not meet four fundamental characteristics. The following screening factors were considered when evaluating an alternative removal action:

- The feasibility of the technology.
- The acceptability of the technology in light of institutional considerations.
- The human health and environmental protection provided by the technology.
- The ability of the technology to produce the desired results within the short-term.

As noted in Sections 2 and 3 of this EE/CA, there are numerous chemical-, location-, and action-specific concerns relating to human health and environmental issues. It is assumed, for purposes of this EE/CA, that removal (full or partial) of the waste materials will lessen the potential for a contaminant release. Waste materials at the site consist of contaminated soil. Therefore, the primary goal of the removal alternative selected is either the removal and final off-site disposal or the effective isolation of contaminated soils. For the purpose of this section's response action identification and evaluation, the alternatives were considered to be protective of human health and the environment if the action resulted in the prevention of contact with future users of the site, and also prevented the future migration of contaminants to groundwater. Further, the removal action should not preclude any future remedial actions at the site.

General response actions have been identified for the Yard Area, the Furnace Courtyard Area, and the Storage Tank Area, based on the information and data presented and discussed in the previous sections of this EE/CA. The general response actions and their expected applicability to the removal of the waste materials at the sites are presented in Table 4-1. According to EE/CA guidance, alternative technologies that have not been proven or developed to the commercial scale are not considered as viable response actions for removals and therefore are not included here.

The identified Response Actions do not include No Action or Institutional Controls/Monitoring because these options do not meet the main objective, which is to remove or isolate the accessible waste materials from the site.

Three gas pipelines transect the Yard Area of the site. In some locations (near the buildings) these are as close as four feet to the ground surface, according to Public Service Electric and Gas Company drawings. The exact location and depths of these lines would have to be delineated as part of the removal activity design. The construction activities could be curtailed in the area of the pipes. This is discussed in the detailed analysis in Section 5.

4.1 YARD AREA

4.1.1 Excavation and Off-site Disposal

Under this alternative, soils in the yard area would be excavated to an average depth of four feet. Based on the soil boring data, this would reduce PCB and dioxin levels by one to two orders of magnitude. However, the resulting concentrations would probably not be sufficiently lowered to allow direct contact. Therefore, the excavated material would be replaced with clean fill and protected from erosion. Erosion protection can be provided either by a vegetative or a gravel cover. In order to promote runoff rather than infiltration, a vegetative cover is assumed. It is noted that during the design phase for this option, the amount of cover material could be reduced. There will not necessarily be a need to bring the site back to original grade. However, a minimum cover may be required for the gas pipelines and to promote drainage. For the purpose of this estimate, it is assumed the site would be brought back to original grade.

Institutional controls would be required to prevent subsequent regrading of this area and potential exposure to contaminated soils. This would not necessarily preclude the areas from being utilized in the future, but any earth moving activities would have to be carefully planned and controlled. This would especially apply to installation of underground utilities.

The lead levels in soils in the Yard area are generally above 1,000 ppm. It is unknown if this material would be a hazardous waste due to the leachability of lead. For the purpose of this EE/CA, it is assumed that this material would be a hazardous waste, and would therefore require treatment prior to landfill disposal.

4.1.2 Excavation and Off-site Incineration/Disposal

In order to reduce future liability associated with landfill disposal of organics-contaminated soil (especially dioxins), the soil could be incinerated. This would be accomplished at an off-site, commercial incinerator, after which the soil would be landfilled as a hazardous waste (based on lead). Because of the lead content, it is again assumed that treatment of the soil would be required prior to landfill. Aside from the incineration step, this option is the same as excavation and off-site disposal as discussed in Section 4.1.1.

4.1.3 In Situ Stabilization

This alternative would limit the potential for migration of contaminants by the addition of a stabilizing agent. Typically, this could be lime, Portland cement, or cement kiln dust. A pilot study would be required to establish a suitable stabilizing agent and dosage. The resultant stabilized material would be relatively impermeable, and monolithic, similar to a low grade concrete. Dusting could still occur at the surface. Therefore, it would be covered with two feet of clean fill.

Stabilization could be provided using either fixed or mobile equipment. Fixed equipment typically consists of a pug mill, where the soil is mixed with the stabilizing agent. Using fixed equipment requires excavation of the soils, stockpiling, feeding to the pug mill, staging in another stockpile, and placement. Because of concerns about dioxins in the soils, and potential exposure pathways due to wind and storm water erosion, a fixed stabilization system is not considered optimum for this site. A mobile system allows in situ stabilization of the soils. Under this arrangement, a stabilization mechanism is attached to the end of a back-hoe. This device has long "prongs" that rake into the soil to a maximum depth of approximately four feet. The stabilizing agent is discharged into the soil as the prongs break-up and mix the soil. Following the mixing procedures, the material is compacted. This operation is more suitable for the site because it greatly diminishes dusting potential.

Due to the addition of the stabilization additive and to the addition of cover material, the site grade would be appreciably increased by this option. The amount of cover material is somewhat arbitrary, and, depending on the anticipated future land use and institutional controls, could potentially be reduced.

4.1.4 Capping

This alternative would use an engineered cap to isolate the contaminated soil and prevent infiltration of storm water. The site might require minor regrading, but basically the cap would be installed over the existing topography. The cap would consist of multiple layers, including an impervious, synthetic membrane, and would be designed to support vegetation, promote surface drainage, and remove water that infiltrated the soil cover. Institutional controls would be required to maintain the integrity of the cap, including periodic maintenance procedures. The cap would raise the topography by approximately three feet.

4.2 FURNACE COURTYARD AREA

4.2.1 Excavation, Off-site Disposal, Capping

Under this alternative, the building and furnace would be removed, and soils would be excavated to a depth of four feet and transported off-site for disposal. As noted in Subsection 3.5, it is assumed that pretreatment of this material would be required due to classification as a hazardous waste due to lead. These soils exhibit the highest levels of volatile contaminants found on-site, and also dioxins in the low ppb levels.

Following the excavation, this area would be brought to original grade using clean fill and an asphalt cover. Groundwater infiltrating the excavation would be handled in one of two ways. First, it could be pumped from the excavation and transported off site for treatment and disposal. Second, it could be left in the excavation, and a uniformly graded granular backfill could be placed in the excavation and used to displace the accumulated water. The cover would then be installed and would consist of crushed stone, a bituminous binder layer, and a bituminous top layer. No geomembrane would be used because the most contaminated soil would have been removed and the asphalt surface would prevent almost all storm water from infiltrating.

4.2.2 Excavation and Off-site Incineration/Disposal Capping

Under this alternative, the excavated soil would be incinerated at an off-site, commercial facility. Following incineration, the soil would be landfilled as a hazardous waste. Aside from the incineration step, this alternative would be the same as excavation and off-site disposal, as discussed in Section 4.2.1.

4.2.3 Complete Excavation of Fill and Off-site Disposal

Under this alternative, Building 2 and the furnace would be removed (including foundations). The soil would be excavated to the limit of historic fill (approximately 10 feet deep) and removed for off-site disposal as a hazardous waste. Because the excavation would be below the water table and adjacent to

building foundations, shoring would be required. Soil samples would be collected from the bottom of the excavation for characterization purposes, but the excavation would not be expanded based on the results. Groundwater infiltrating the excavation would be handled in one of two ways. First, it could be pumped from the excavation, treated on site, and transported off site for treatment and disposal. On site treatment is assumed more practical for this alternative than for the 4-ft excavation because a larger quantity of groundwater would potentially accumulate. The excavation would then be backfilled with clean fill. Second, the groundwater could be left in the excavation, and a uniformly graded granular backfill could be placed in the excavation and used to displace the accumulated water. Because of the extent of the excavation, essentially all source material should be removed and no cap would be required.

4.2.4 Bioventing and Capping

In order to remove the volatile organics without disturbing the soil, a bioventing system would be utilized. Bioventing typically consists of the injection of air into a subsurface media (usually soil, but it can also be below the water table) and collection of the off-gas in a vacuum system nearer the surface. In some cases, the off-gas is not collected. Another variation is to use just the vacuum to induce the air flow. The Furnace Courtyard Area is a somewhat difficult application for bioventing, because the combination of sparged air and applied vacuum serve to raise the water table. Because the depth of groundwater is very shallow (2-feet) in this area, the gas collection system could easily clog. To minimize this problem, the system would be designed as follows. A layer of crushed stone would be placed on the surface of the soil, and parallel, perforated pipes placed horizontally within the stone. A slight vacuum would be applied to the pipes via a blower, just enough to induce a small air flow. The principle of bioventing is to supply just enough air to satisfy the stoichiometric oxygen requirements for biodegradation; any excess air would result in stripping. Therefore, maintaining a minimal air flow is key to controlling the process. The exhaust air should contain very little of the biodegradable volatiles (ethylbenzene, toluene, styrene) but may strip some of the chlorinated volatiles. Therefore, it will be passed through vapor phase granular activated carbon prior to being emitted. In order to prevent both short circuiting of the air flow and infiltration of storm water, the surface (above the vapor collection piping) would be sealed. This would consist of a base (binder) layer of asphalt, and a top layer of

asphalt. It may also be necessary to seal the sides of this area, down to the water table, to prevent short circuiting. This could be accomplished with a geomembrane or a clay slurry.

4.2.5 In Situ Stabilization and Capping

In situ stabilization would be conducted as described for the yard area, to a depth of four feet below existing ground surface. Following the stabilization, an asphalt cap would be applied. Because the stabilizing material would have a much higher compressive strength than soil, a stone base should not be necessary, and the binder course of asphalt would be applied directly to the stabilized soil. A top course of asphalt would then be applied over the base course.

4.2.6 Capping

The final option for this area is capping. Because the area is located between buildings in a developed section of the facility, it has a high potential for re-use. Also, it is relatively small (compared to the Yard Area), so it does not generate excessive quantities of storm water runoff. Accordingly, the cap in this area would be designed differently from the Yard Area cap. It would consist of a geomembrane, a base layer of crushed stone, a base (binder) layer of asphalt, and a top layer of asphalt.

4.3 STORAGE TANK AREA

4.3.1 Excavation, Off-site Disposal, Capping

The excavation and capping activities would be the same as described for the Furnace Courtyard Area. In addition, the one (1) aboveground tank and four (4) underground tanks would be removed. Four feet of soil would be removed, clean fill would be placed in the excavation, and the surface would be protected by an asphalt cap. Infiltrated groundwater would either be removed or displaced with a uniform, granular backfill. The excavated soil would be transported to a secure landfill for disposal as a hazardous waste. As with the Yard and Furnace Courtyard Areas, it is assumed that treatment would be required for lead prior to placement in a landfill.

4.3.2 Excavation and Off-site Incineration/Disposal, Capping

The excavation and capping activities in the Storage Tank Area would be the same as described Section 4.3.1, above. Four feet of soil would be removed, clean fill would be placed in the excavation, and the surface would be protected by an asphalt cap. However, the excavated soil would be processed at a commercial incinerator prior to being landfilled as a hazardous waste. Infiltrated groundwater would either be removed or displaced with a uniform, granular backfill.

4.3.3 In Situ Stabilization and Capping

The in situ stabilization and capping activities in the Storage Tank Area would be the same as described for the Furnace Courtyard Area. Prior to these activities, the one (1) aboveground tank and four (4) underground tanks would be emptied and removed. The asphalt cap would be placed directly on the stabilized material.

4.3.4 Capping

The capping activity in the Storage Tank Area would be the same as described for the Furnace Courtyard Area. A geomembrane would be placed under the asphalt cap. Prior to these activities, the one (1) aboveground tank and four (4) underground tanks would be emptied and removed.

Table 4-1
Response Action Summary
Bayonne Barrel and Drum Site
Newark, New Jersey

Response Action	Associated Technology
Yard Area	
<ul style="list-style-type: none"> Excavation and off-site disposal of soil to a depth of 4 feet. Replace with clean fill. 	Off-site treatment (stabilization); secure landfill.
<ul style="list-style-type: none"> In situ stabilization of all contaminated media to a depth of 4 feet. Cover with two feet clean soil. 	Mobile stabilization equipment
<ul style="list-style-type: none"> Excavation and off-site incineration and disposal of soil to a depth of 4 feet. Replace with clean fill. 	Off-site treatment (incineration, stabilization); secure landfill.
<ul style="list-style-type: none"> Capping 	Secure cap.
Furnace Courtyard Area	
<ul style="list-style-type: none"> Demolition of structures. Excavation to depth of 4 feet and off-site disposal. Replacement with clean fill and cover with asphalt. Off-site treatment and disposal of infiltrated groundwater. 	Off site treatment (stabilization); secure landfill. Collection and off-site treatment of infiltrated groundwater from excavation, if required.
<ul style="list-style-type: none"> Demolition of structures. Excavation to depth of 4 feet and off site incineration and disposal. Replacement with clean fill and cover with asphalt. Off-site treatment and disposal of infiltrated groundwater. 	Off site treatment (incineration, stabilization); secure landfill. Collection and off-site treatment of infiltrated groundwater from excavation, if required.
<ul style="list-style-type: none"> Demolition of structures. Excavation to a depth of 10 feet and off-site disposal. Replacement with clean fill and cover with gravel. On-site treatment and off-site disposal of infiltrated groundwater. 	Off site treatment (stabilization); secure landfill. Collection and filtration and activated carbon treatment of infiltrated groundwater from excavation.
<ul style="list-style-type: none"> Bioventing with off-gas treatment; asphalt cap. 	Bioventing system. Vapor-phase granular activated carbon treatment.
<ul style="list-style-type: none"> In situ stabilization; asphalt cap. 	Mobile stabilization equipment
<ul style="list-style-type: none"> Capping 	Secure cap.

Table 4-1
Response Action Summary
Bayonne Barrel and Drum Site
Newark, New Jersey
(continued)

Storage Tank Area	
<ul style="list-style-type: none"> • Removal of above ground and under ground tanks. 	Demolition/excavation.
<ul style="list-style-type: none"> • Excavation to depth of 4 feet and off site disposal. Replacement with clean fill and cover with asphalt. Off-site treatment and disposal of infiltrated groundwater. 	Off site treatment (e.g., incineration, stabilization), secure landfill. Collection and off-site treatment of infiltrated groundwater from excavation.
<ul style="list-style-type: none"> • Excavation to depth of 4 feet and off site incineration and disposal. Replacement with clean fill and cover with asphalt. Off-site treatment and disposal of infiltrated groundwater. 	Off site treatment (stabilization), secure landfill. Collection and off-site treatment of infiltrated groundwater from excavation, if required.
<ul style="list-style-type: none"> • In situ stabilization; asphalt cap. 	Mobile stabilization equipment
<ul style="list-style-type: none"> • Capping 	Secure cap

SECTION 5

ANALYSIS OF REMOVAL ACTION ALTERNATIVES

5.1 INTRODUCTION

In this section, a detailed analysis of the response actions developed in Section 4 of this EE/CA that satisfy the objectives stated in Section 3 is presented for each of the three site areas (Yard, Furnace Courtyard, and storage Tank). This analysis facilitates a comparison of the alternatives based on the action-specific ARARs followed by a four-step analysis of each alternative. Relevant and applicable environmental standards and generally accepted engineering practices were considered in determining suitable actions or technologies. The following criteria were used to evaluate these alternatives:

- Effectiveness.
- Implementability.
- Cost.

Expanded descriptions of these criteria are provided below. Specific evaluation of the alternatives based upon these criteria is provided in Subsections 5.2, 5.3, and 5.4.

5.1.1 Effectiveness

The removal alternative selected must adequately protect human health and the environment. The alternatives are evaluated for their effectiveness in mitigating the existing or potential contaminant exposure to site personnel. The factors to be incorporated into the environmental effectiveness evaluation include:

- Adequately protects human health and the environment in regard to both the long-term effects of the residual contamination and the short-term effects caused by implementation of the removal action is required.
- Applicable health and environmental standards (i.e., ARARs) are used to evaluate each alternative.
- The likelihood of on-site source control or off-site removal actions being effective in mitigating and/or minimizing the threat to human health, welfare, and the local environment.

- The prevention of additional environmental (soil, surface water, and groundwater) contamination.
- The potential for adverse environmental effects resulting from the alternative or its implementation.

During the evaluation and implementation of waste material removal actions at the site, worker health and safety must also be considered. Any measures that have the potential for worker contact or release of hazardous substances must conform to OSHA requirements.

5.1.2 Implementability

Implementability addresses the technical and administrative considerations in the implementation of an alternative. This evaluation includes the following factors:

- **Technical Feasibility.** This criterion considers whether the technology is both demonstrated and can be readily constructed/operated; can be implemented within the \$2 million/12 month statutory framework; and is suitable to the site-specific conditions.
- **Availability.** This criterion considers the availability of goods and services, including equipment, personnel, and off-site treatment and disposal capacities.
- **Administrative Feasibility.** This criterion considers what permits would be required, whether institutional controls can be imposed, whether public opposition is likely to delay or prevent implementation, and whether easements or right-of-ways are required to complete the removal action.

5.1.3 Cost Analysis

A removal alternative should be implemented and operated in a cost-effective manner and must mitigate the environmental concerns at the site. This requires ensuring that the results of a particular alternative cannot be achieved by less costly methods. In considering the cost-effectiveness of the various alternatives, both capital and operating costs are considered. The present worth value method is used to evaluate the total cost of a removal alternative's strategy, including the post-removal period and to compare the cost-effectiveness of the various alternatives. The cost analysis presented in this

EE/CA represents cost estimates for the developed removal alternatives based on the existing data presented herein.

5.2 YARD AREA

5.2.1 Excavation and Off-site Disposal

As detailed in Subsection 4.2 of this EE/CA, Alternative 1 entails the removal of the top four feet of soil in the yard area; this material would be transported to an off-site landfill for disposal. The soils would be removed by mobile earth moving equipment. Following removal, surface soil samples would be collected from the newly exposed soil surface. The purpose of these samples would not be to determine if additional excavation should be conducted, because the removal alternative would not be based on achieving a specific residual concentration in the site soils. Rather, this data would serve to document post-removal site conditions, for consideration in regard to evaluating any further remedial actions on the site.

The yard area encompasses approximately 11 acres. Therefore, this removal action would require the excavation and off-site disposal of approximately 73,000 cu. yd. of soil.

During removal activities, erosion and sedimentation (E&S) controls, such as diversion ditches, berms, and silt fencing, will be provided as necessary to prevent off-site migration of contamination. Dust control may also be required.

5.2.1.1 Process Description

The removal/excavation and final off-site disposal of the contaminated soils will consist of the following steps:

- Excavation/transport.
- Sampling/analysis (to verify post-removal conditions).
- Off-site treatment/disposal.
- Site restoration.

These steps are described in the following subsections.

Excavation/Transport

The site soils contain numerous organic and inorganic constituents, including arsenic, polyaromatic hydrocarbon (PAHs), PCBs, and dioxins. A key objective of any removal action is not to allow the action to result in mobilization of the contaminated media. This is of obvious concern with an excavation of this magnitude, where dusting or storm water runoff could occur.

In order to minimize dusting, the excavated soils would be loaded directly into trucks. No on-site stockpiles would be used. All trucks would be covered with tarps, and tires would be cleaned at a washing station before leaving the site. If required by site condition, temporary roads (crushed stone) would be installed to provide trucks with access to all points in the Yard Area. For the purpose of this estimate it is assumed that 3000 linear feet of temporary roadway would be required. These roads would be 10 feet wide by 8 inches thick.

In the vicinity of the gas pipelines, hand excavation would be required to prevent damage to the pipelines. The exact locations of the pipelines would first be delineated by the transmission companies that own them. No mechanized excavation would take place within 3 feet of the pipelines.

Following excavation, the exposed soil would be kept moist using a water spray, in order to prevent dusting.

Sampling/Analysis

Surface soil samples (0-1 feet depth interval) would be collected on the intersections of a 100-ft grid. These samples would be analyzed for SVOCs, metals, TPH, pesticides/PCBs, and dioxins. This data would provide the basis for a future risk assessment, if required, including modeling of migration potential to groundwater. The results would not be used as a basis for expanding the removal action.

Off-Site Treatment/Disposal

The excavated soil would contain a wide range of organic and inorganic contaminants. As explained in Subsection 3.5, the lead concentration may result in a classification as a characteristic hazardous waste. In order to prevent the stockpiling of material on-site, this would need to be pre-determined (before any excavation activities). Because the lead concentrations in soil are elevated, it is possible that the soil would require management as a D008 hazardous waste (TCLP toxic for lead). If so, according to the LDR's under RCRA, the soil would require treatment such that the lead concentration in the TCLP extract would be below 5.0 mg/L. For the purpose of this EE/CA, it is assumed that the soil would be a RCRA characteristic hazardous waste and would therefore require treatment prior to disposal.

The waste also contains PCBs at concentrations exceeding 50 ppm, which are regulated under TSCA. Soils containing PCB concentrations above 50 ppm must be disposed of in a TSCA-permitted landfill. Therefore, the landfill accepting the contaminated soil must be permitted under both RCRA and TSCA.

The treatment of the soil to meet the LDR limit for lead would take place at a RCRA permitted facility, probably at the landfill. It would also be possible to treat the soil in situ, then excavate and transport it to a landfill. However in order to minimize disturbances of the dioxin-containing soils, it is assumed that off-site treatment would be performed.

Site Restoration

Site restoration would consist of placement of clean fill in the excavation, covering with top soil, and establishing a vegetative cover. Placement of the clean fill could begin as soon as samples were collected; it should not be necessary to receive the results of sample analyses. The vegetative cover would be a grass or low maintenance ground cover, which would have to be maintained indefinitely. This maintenance would consist of filling any depressions, repairing damage due to erosion, and preventing the growth of woody vegetation.

5.2.1.2 Effectiveness

This action would effectively reduce the potential for human contact and ecological exposure with the contaminated surface soils. As long as the fill material were not disturbed, there would not be a completed pathway for exposure to occur. The potential for wind or storm water erosion would also be eliminated. The potential for infiltration to groundwater would remain. However, the most contaminated material would have been removed, and the contaminants present are, in general, not highly mobile. This action would not preclude any future site actions in regard to groundwater clean-up.

There are no ARARs for the contaminated soils. Removing the contaminated materials and replacement with clean fill, with institutional controls on future land use, would result in exposures in compliance with the NJDEP guidance's. The site use would not be unrestricted, however, and no activities involving excavation would be allowed unless approved in accordance with the terms of the institutional controls.

There would be a potential for increased migration due to the implementation of this alternative. Over 70,000 cu. yd. of soil would require excavation, loading, and transport. Although engineering controls would be in place to minimize the migration of contamination, the potential for some degree of migration would nonetheless exist. An Erosion and Sedimentation Control Plan would be developed to prevent migration of contaminated sediments, and dust control measures (using water or foam to control dusting) would likewise be implemented.

5.2.1.3 Implementability

The alternative is readily implementable in a technical sense. Standard earth moving equipment is required and widely available. No permits would be required, unless collected storm water was treated on-site and discharged. Due to the nature of the fill (cinders) it is not expected that water would collect. The site is surrounded by major highways and commercial land (multi-screen movie theater). Due to the size of the project, residents in the area may be concerned regarding potential migration of

the contamination. An excavation of this magnitude would be highly visible and the engineering/operational controls to prevent migration would need to be explained to the public. It is noted that if this material were determined to be a dioxin-listed hazardous waste, it may not be possible to landfill. Incineration would be required as a pretreatment. There is presently only one incinerator in the country (Coffeyville, KS) that is permitted to burn dioxin-listed RCRA hazardous waste, and it is presently scheduled to close in the beginning of 1998 (this closure is not definite).

5.2.1.4 Cost

The cost analysis is shown in Table 5-1. The maintenance cost is based on 3% of the capital cost of the site restoration, for a period of 30 years. The total present worth of this alternative is \$29,124,000. It should be noted that these costs could potentially be changed due to the following factors:

- Depth of excavation. A more exact vertical profile could be developed (e.g., results every six inches). This would potentially allow a decrease volume of excavation, with a higher analytical cost.
- Classification as a Non-hazardous Waste. The waste could be determined not to be a hazardous waste. The cost of disposal at a landfill would not be markedly effected by this determination, but this would negate the need for treatment prior to disposal, resulting in a savings of \$4.4 million.
- Classification as a listed RCRA waste. As noted in Section 3.5, there is currently no basis for classifying the site soils as listed RCRA wastes. If the soils were classified as a listed hazardous waste, additional pretreatment might be required.
- Classification as a listed hazardous waste due to dioxin. In this case, incineration would be required as pretreatment. Based on an incineration/disposal unit cost of \$4000 per ton at the Coffeyville incinerator, this would increase the cost of disposal (by more than a factor of 10), as noted in Subsection 5.2.2.

5.2.2 Excavation and Off-site Incineration/Disposal

5.2.2.1 Process Description

This option is exactly the same as the excavation option described in Section 5.2.1, except the soil would be incinerated prior to disposal in a secure landfill.

5.2.2.2 Effectiveness

Insofar as the site is concerned, the effectiveness of this alternative is identical to excavation and off-site disposal (Section 5.2.1). Because it would be incinerated, the organic contaminants would be destroyed rather than immobilized in a secure landfill.

5.2.2.3 Implementability

This alternative is readily implementable. Commercial capacity is available to incinerate this material. It is noted that if this material were determined to be a dioxin-listed hazardous waste, it may not be possible to incinerate. There is presently only one incinerator in the country (Coffeyville, KS) that is permitted to burn dioxin-listed RCRA hazardous waste, and it is presently scheduled to close in the beginning of 1998 (this closure is not definite).

5.2.2.4 Cost

The cost analysis is shown on Table 5-2. The maintenance cost is based on 3% of the capital cost of the site restoration, for a period of 30 years. The total present worth of this alternative is \$138,498,000. It should be noted that these costs could potentially change due to the following factors:

- Depth of excavation. A more exact vertical profile could be developed (e.g., results every six inches). This would potentially allow a decreased volume of excavation, with a higher analytical cost.
- Classification as a non-hazardous waste. The waste could be determined not to be a hazardous waste. The cost of disposal at a landfill would not be markedly effected by this

determination, but this would negate the need for treatment prior to disposal, resulting in a savings of \$4.4 million.

- Classification as a listed RCRA waste. As noted in Section 3.5, there is currently no basis for classifying the site soils as listed RCRA wastes. If the soils were classified as a listed hazardous waste, additional pretreatment might be required.
- Classification as a listed hazardous waste due to dioxin. In this case, incineration would be required as pretreatment. Based on an incineration/disposal unit cost of \$4000 per ton at the Coffeyville incinerator, the incineration/disposal costs would approximately quadruple, to over \$400 million. It should be noted, however, that for a such a large quantity of waste, a lower unit cost could probably be negotiated. Nevertheless, the cost increase would remain extremely high.

5.2.3 In Situ Stabilization and Cover

In situ stabilization would not involve excavation or off-site disposal of soils. It would be intended to immobilize the contaminants in the top four feet of soil. No further characterization sampling would be conducted.

5.2.3.1 Process Description

The stabilization/cover alternative will consist of:

- Mobilization of stabilization equipment.
- In Situ stabilization.
- Installation of final cover.

Mobilization of Stabilization Equipment

Stabilization equipment includes mobile equipment for the application of the stabilization agent and stationary equipment for the storage and transfer of the stabilization reagent. The reagent would typically be stored in a silo, of sufficient capacity to hold a full delivery from a truck. The truck would be unloaded pneumatically, and the silo would have a dust collector at the top. From the silo, the agent can be conveyed either pneumatically or hydraulically. Because dusting is a major concern, a hydraulic conveyance system would be used. The reagent itself is not particularly

hazardous (typically cement or lime), but even minor dusting would be a concern because it could not be readily differentiated from dust originating from the contaminated soil.

The number of mobile stabilization units used would depend on the schedule. For this EE/CA, it is estimated that two silos would be required.

In Situ Stabilization

The stabilizing agent would be metered from the silo into a mixing chamber and mixed with water. It would then be pumped through flexible hoses to the stabilization unit, which would be mounted on an excavator. The stabilization unit consists of a fork-type device, mounted where the excavator bucket would normally be located. Steel pipe convey the stabilizing agent to the tips of the fork, where it is worked into the soil. A unit can typically stabilize 500 yd³ per day. The silos would be relocated, as required, during the stabilization process. After the addition and mixing of the stabilization agent, the soil would be compacted. A slight volume increase would be realized as a consequence of adding the reagent. The soil directly adjacent (within 3 feet) of the gas pipelines would not be stabilized.

Installation of Final Cover

The final cover would consist of 24 inches of soil; the top six inches would be top soil. The soil would be placed in lifts and compacted, and the top would be seeded with a ground cover. Temporary E&S controls would be installed and maintained until the vegetation was established.

5.2.3.2 Effectiveness

This action would effectively reduce the potential for human contact and ecological exposure with the contaminated surface soils. As long as the cover material were not disturbed, there would not be a completed pathway for exposure to occur. The potential for wind or storm water erosion would also be eliminated. The potential for infiltration to groundwater would remain. However, the most

contaminated material would have been stabilized, greatly decreasing the permeability of the soil and, therefore, the degree of infiltration of storm water. Furthermore, the contaminants present in the deeper, unstabilized soils are not highly mobile. This action would essentially preclude future excavation activities at the site in regard to groundwater cleanup or site development, except for minor regrading. It would not preclude placement of additional fill material, because the stabilized material would have a higher load-bearing capacity than the current soils. Groundwater actions such as pump and treat, in situ treatment, or slurry wall containment would not be significantly affected.

There are no ARARs for the contaminated soils. Stabilizing the contaminated materials and covering with clean fill, with institutional controls on future land use, would result in exposures in compliance with the NJDEP guidance's. The site use would not be unrestricted, however, and no activities involving excavation would be allowed unless approved in accordance with the terms of the institutional controls.

There would be some potential for increased migration due to the implementation of this alternative, although considerably less than the excavation alternative. The stabilization process would not require excavation of the soil, but would necessitate soil disturbance as the stabilizing agent was mixed with the soil. The mixed soil is a slurry, so there would be no real potential for dusting after the mixing was complete. Dusting potential during the mixing operation would be minimized by wetting the soil prior to mixing. An Erosion and Sedimentation Control Plan would be developed to prevent migration of contaminated sediments.

5.2.3.3 Implementability

The alternative is readily implementable in a technical sense. The stabilization equipment is proprietary but readily available. Alternative process equipment could also be used. No permits would be required, except for an air permit for emissions from the cement silo during filling operations. This could require a review period of up to three months. A treatability study would be required to establish the type and dosage of the stabilization reagent. This could be implemented quickly, and completed in four to six weeks. A permit would also be required for any collected storm water that was treated on-site and

discharged. However, it is not expected that this would be necessary. As long as E&S controls were maintained, the storm water runoff should not be any more contaminated than is presently the case. The site is surrounded by major highways and commercial land (movie theater). However, due to the size of the project, residents in the area may be concerned regarding potential migration of the contamination. The stabilization would not be highly visible except for the reagent silo and the placement of cover material. The engineering/operational controls to prevent migration would need to be explained to the public.

5.2.3.4 Cost

The cost analysis is shown in Table 5-3. The maintenance cost is based on 3% of the capital cost of the site restoration, for a period of 30 years. The total present worth of this alternative is \$5,528,000. It should be noted that these costs could potentially be changed due to the following factors:

- Depth of stabilization. A more exact vertical profile could be developed (e.g., results every six inches). This would potentially allow a decreased volume requiring stabilization, with a higher analytical cost.
- Reagent type and quantity. A treatability study would be required to determine the most cost effective stabilization reagent and the required dosage. For this EE/CA, it has been assumed that Portland cement would be used at a dosage of 15% by weight; however, this could either increase or decrease based on the treatability study.

5.2.4 Capping

Capping would not involve excavation or off-site disposal of soils. It would be intended to isolate the contaminants in the soil. No further characterization sampling would be conducted.

5.2.4.1 Process Description

The capping alternative will consist of:

- Preparation of subbase

- Installation of geomembrane, geonet, and geotextile
- Placement of cover soil

Preparation of Subbase

In order to protect the synthetic liner from punctures, a subbase would be prepared and proof rolled. This material must be free of stones or debris that could cause a tear or puncture of the liner. It is possible that the existing site soils would be suitable for this purpose, but this would have to be verified during the design process. Furthermore, some degree of regrading will be necessary to provide positive drainage from the cap. Using a subbase material from an off-site source would allow minor grade changes to be made with the subbase material, rather than disturbing the site soils. The use of compaction equipment above the gas pipelines would be evaluated during the design stage. It is not envisioned that this would pose a problem; however, vibratory hand compactors could be used, if required.

Installation of Geomembrane, Geonet, and Geotextile

A geomembrane, underlain by a bedding geotextile, would be placed over the prepared subbase. This is commonly a high density polyethylene (HDPE) material (40-mil thickness or greater), but other synthetic materials and thicknesses are also used. A geonet, also a synthetic material, would be placed over the geomembrane. The purpose of the geonet is to provide drainage of infiltrated storm water, so there is no accumulation of standing water above the liner. The geonet is a semi-rigid material, approximately one quarter inch thick, that contains a network of small drainage channels. A geotextile, a woven porous material, is then placed over the geonet to prevent soils from washing into the drainage channels and clogging the geonet. In place of a geonet, a porous media, such as pea gravel, can also be used.

Placement of Cover Soil

The cover soil would consist of a minimum of 24 inches of soil, the top six inches of which would be top soil. The soil would be placed in controlled lifts and compacted, and the top would be seeded to establish a ground cover. Temporary E&S controls would be installed and maintained until the vegetation was established.

5.2.4.2 Effectiveness

This action would effectively reduce the potential for human contact and ecological exposure with the contaminated surface soils. As long as the cap was not disturbed, there would not be a completed pathway for exposure to occur. The potential for wind or storm water erosion would also be eliminated. The potential for infiltration to groundwater would be essentially eliminated for all material above the water table. This action would essentially preclude future excavation activities at the site in regard to groundwater cleanup or site development. Groundwater actions such as pump and treat, in situ treatment, or slurry wall containment would not be significantly affected.

There are no ARARs for the contaminated soils. Capping the contaminated materials, with institutional controls on future land use, would result in exposures in compliance with the NJDEP guidance's. The site use would not be unrestricted, however, and no activities involving excavation would be allowed unless approved in accordance with the terms of the institutional controls.

There would be very little potential for increased migration due to the implementation of this alternative, unless regrading were require to promote drainage. An Erosion and Sedimentation Control Plan would be developed to prevent migration of contaminated sediments.

5.2.4.3 Implementability

The alternative is readily implementable in a technical sense. Capping is a well-established technique and is widely used. A formal engineering design would need to be completed prior to initiating work at

the site; this would require approximately six months. No permits would be required, unless any storm water was treated and discharged on site. However, it is not expected that this would be necessary, inasmuch as the site activities would mainly consist of placing fill on undisturbed soil. There would be some excavation required in order to anchor the geomembrane and channel the precipitation collected and "daylighted" by the geonet and shed by the cap. Storm water collected in any excavations would be hauled off site for disposal. However, due to the type of fill present, it is expected that very little water would accumulate. The site is surrounded by major highways and commercial land (movie theater). However, due to the size of the project, residents in the area may be concerned regarding potential migration of the contamination. The capping procedure would involve placing acres of geosynthetics, as well as significant quantities of soil, and would therefore be highly visible. The engineering/operational controls to prevent migration would need to be explained to the public. The cap would be continuous over the Yard Area, meaning it would also cover the gas pipelines that run across the site. Therefore, if maintenance on these pipelines were required in the future, it would be necessary to temporarily remove the cap in the area of maintenance.

5.2.4.4 Cost

The cost analysis is shown in Table 5-4. The maintenance cost is based on 3% of the capital cost of the site restoration, for a period of 30 years. The total present worth of this alternative is \$1,903,000.

5.3 FURNACE COURTYARD AREA

5.3.1 Excavation and Off-site Disposal

This alternative entails the removal of the top four feet of soil in the yard area; this material would be transported to an off-site landfill for disposal. In order to remove this soil, the building and furnace in the courtyard area would first need to be demolished and removed. The soils would be removed by mobile earth moving equipment. Following removal, surface soil samples would be collected from the newly exposed soil surface. The purpose of these samples would not be to determine if additional excavation should be conducted, because the removal alternative would not be based on achieving a specific residual concentration in the site soils. Rather, this data

would serve to document post-removal site conditions, for consideration in regard to evaluating any further remedial actions on the site.

The Furnace Courtyard Area is relatively small, encompassing approximately one third acre. This removal action would require the excavation and off-site disposal of approximately 2,300 cu. yd. of soil.

During removal activities, erosion and sedimentation (E&S) controls, such as diversion ditches, berms, and silt fencing, will be provided as necessary to prevent off-site migration of contamination. Dust control may also be required.

5.3.1.1 Process Description

The removal/excavation and final off-site disposal of the contaminated soils will consist of the following steps:

- Demolition of building and furnace
- Excavation/transport
- Sampling/analysis (to verify post-removal conditions).
- Off-site treatment/disposal.
- Site restoration.

These steps are described in the following subsections.

Demolition of Building and Furnace

The building would be demolished using heavy equipment, then loaded into dump trucks for disposal at a solid waste landfill. All footings and foundations would be removed and disposed of as hazardous waste. The furnace itself would be dismantled (cut into scrap). No cost has been assumed for the disposal of the furnace; it is assumed this could be sold as scrap metal.

Excavation/Transport

The site soils contain numerous organic and inorganic constituents, including arsenic, polyaromatic hydrocarbon (PAHs), PCBs, and dioxins. A key objective of any removal action is not to allow the action to result in mobilization of the contaminated media due to dusting or storm water runoff. In order to minimize dusting, the excavated soils would be loaded directly into trucks. No on-site stockpiles would be used. All trucks would be covered with tarps, and tires would be cleaned at a washing station before leaving the site. Following excavation, the exposed soil would be kept moist using a water spray, in order to prevent dusting.

The excavation could be complicated by the presence of underground utilities. The extent, if any, of such utilities is unknown, but an allowance will be made in the cost estimate for this alternative for the hand excavation of 10% of the soils.

Sampling/Analysis

Surface soil samples (0-1 feet depth interval) would be collected from six locations. These samples would be analyzed for VOCs, SVOCs, metals, TPH, pesticides/PCBs, and dioxins. This data would provide the basis for a future risk assessment, if required, including modeling of migration potential to groundwater. The results would not be used as a basis for expanding the removal action.

Off-site Treatment/Disposal

The excavated soil would contain a wide range of organic and inorganic contaminants. As explained in Subsection 4.2.1, the lead concentration may result in a classification as characteristic hazardous waste. In order to prevent the stockpiling of material on-site, this would need to be pre-determined (before any excavation activities). Because the lead concentrations in soil are elevated (two concentrations were measured at over 10,000 ppm), it is assumed for the purpose of this EE/CA that the soil would require management as a D008 hazardous waste (TCLP toxic for lead). Therefore, according to the

LDR's under RCRA, the soil would require treatment such that the lead concentration in the TCLP extract would be below 5.0 mg/L.

The waste also contains PCBs above 50 ppm, which are regulated under TSCA. PCB contaminated soils above 50 ppm must be disposed of in a TSCA-permitted landfill. Therefore, the landfill accepting the contaminated soil must be permitted under both RCRA and TSCA.

The treatment of the soil to meet the LDR limit for lead would take place at a RCRA permitted facility, probably at the landfill. It would also be possible to treat the soil in situ, then excavate and transport them to a landfill. However in order to minimize disturbances of the dioxin-containing soils, it is assumed that off-site treatment would be performed.

Site Restoration

Site restoration would consist of placement and compaction of clean fill in the excavation, overlain by an 8-inch base of crushed stone. The stone would be covered by a 1.5-inch binder course of asphalt and a 1-inch top course.

5.3.1.2 Effectiveness

This action would effectively reduce the potential for human contact and ecological exposure with the contaminated surface soils. As long as the paved area were not disturbed, there would not be a completed pathway for exposure to occur. The potential for wind or storm water erosion would also be eliminated. The potential for infiltration to groundwater would remain. This is especially true of VOCs, which were found in the Furnace Courtyard area at the highest levels on site, and which are more soluble (therefore more mobile) than the other contaminants. This action would not preclude any future site actions in regard to groundwater clean-up.

There are no ARARs for the contaminated soils. Removing the contaminated materials and replacement with clean fill, with institutional controls on future land use, would result in exposures in

compliance with the NJDEP guidance's. The site use would not be unrestricted, however, and no activities involving excavation would be allowed unless approved in accordance with the terms of the institutional controls. Also, if underground utilities are present in the courtyard, it may be necessary to permanently relocate them so no future excavation would be required.

There would be a potential for increased migration due to the implementation of this alternative. Over 2,500 cu. yd. of soil would require excavation, loading, and transport. Although engineering controls would be in place to minimize the migration of contamination, the potential for some degree of migration would nonetheless exist. An Erosion and Sedimentation Control Plan would be developed to prevent migration of contaminated sediments, and dust control measures (using water or foam to control dusting) would likewise be implemented.

5.3.1.3 Implementability

The alternative is readily implementable in a technical sense. Standard earth moving equipment is required and widely available. No permits would be required, unless collected storm water was treated on-site and discharged. Due to the high groundwater table in this area, it is likely that groundwater would collect in the excavation. However, because the excavation is of a predetermined depth, (i.e., it would not be necessary to increase the dimensions of the excavation due to sampling results) removal of accumulated groundwater would not necessarily be required. Rather, a uniformly-graded, granular fill could be used below the water table, allowing compaction without dewatering. For the purpose of this EE/CA, it is assumed that such a fill would be used. The site is surrounded by major highways and commercial land (movie theater). However, due to the size of the project, residents in the area may be concerned regarding potential migration of the contamination. Excavation within the courtyard would not be highly visible, but the visibility of the site actions must be viewed as a whole. Concern on the part of the surrounding community should be anticipated, and the engineering/operational controls to prevent migration would need to be explained to the public. It is noted that if this material were determined to be a dioxin-listed hazardous waste, it may not be possible to landfill. Incineration would be required as a pretreatment. There is presently only one incinerator in the country (Coffeyville, KS)

that is permitted to burn dioxin-listed RCRA hazardous waste, and it is presently scheduled to close in the beginning of 1998 (this closure is not definite).

5.3.1.4 Cost

The cost analysis is shown in Table 5-5. The maintenance cost is based on annual maintenance of the asphalt cap (sealing plus repair of any cracks), for a period of 30 years. The total present worth of this alternative is \$1,157,000. It should be noted that these costs could potentially be changed due to the following factors:

- Depth of excavation. A more exact vertical profile could be developed (e.g., results every six inches). This would potentially allow a decrease volume of excavation, with a higher analytical cost.
- Classification as a non-hazardous waste. The waste could be determined not to be a hazardous waste. The cost of disposal at a landfill would not be markedly effected by this determination, because it is assumed that due to its CERCLA status and PCB content, the waste would still be sent to a secure landfill. However, this classification would negate the need for treatment prior to disposal, resulting in a savings of \$150,000.
- Classification as a listed RCRA waste. As noted in Section 3.5, there is currently no basis for classifying the site soils as listed RCRA wastes. If the soils were classified as a listed hazardous waste, additional pretreatment might be required.
- Classification as a listed hazardous waste due to dioxin. In this case, incineration would be required as pretreatment. This would increase the cost of disposal (by more than a factor of 10), as noted in Subsection 5.3.2.

5.3.2 Excavation and Off-site Incineration/Disposal

This alternative is the same as described under section 5.3.1 (Excavation and Off-site Disposal), except that the excavated material would first be incinerated to destroy the organic contaminants prior to disposal in a secure landfill.

5.3.2.1 Process Description

The activities under this alternative are identical to those described under Section 5.3.1, except that off-site treatment would consist of both incineration and treatment for lead (typically stabilization), prior to landfilling.

5.3.2.2 Effectiveness

Insofar as the site is concerned, the effectiveness of this alternative is identical to excavation and off-site disposal (Section 5.3.1). Because the soil would be incinerated, the organic contaminants would be destroyed rather than immobilized in a secure landfill.

5.3.2.3 Implementability

This alternative is readily implementable. Commercial capacity is available to incinerate this material. It is noted that if this material were determined to be a dioxin-listed hazardous waste, it may not be possible to incinerate. There is presently only one incinerator in the country (Coffeyville, KS) that is permitted to burn dioxin-listed RCRA hazardous waste, and it is presently scheduled to close in the beginning of 1998 (this closure is not definite).

5.3.2.4 Cost

The cost analysis is shown in Table 5-6. The maintenance cost is based on annual maintenance of the asphalt cap (sealing plus repair of any cracks), for a period of 30 years. The total present worth of this alternative is \$4,560,000. It should be noted that these costs could potentially be changed due to the following factors:

- Depth of excavation. A more exact vertical profile could be developed (e.g., results every six inches). This would potentially allow a decrease volume of excavation, with a higher analytical cost.

- Classification as a non-hazardous waste. The waste could be determined not to be a hazardous waste. The cost of disposal at a landfill would not be markedly effected by this determination, because it is assumed that due to its CERCLA status and PCB content, the waste would still be sent to a secure landfill. However, this classification would negate the need for treatment prior to disposal, resulting in a savings of \$150,000.
- Classification as a listed RCRA waste. As noted in Section 3.5, there is currently no basis for classifying the site soils as listed RCRA wastes. If the soils were classified as a listed hazardous waste, additional pretreatment might be required.
- Classification as a listed hazardous waste due to dioxin. In this case, incineration would be required as pretreatment. Based on an incineration/disposal unit cost of \$4000 per ton at the Coffeyville incinerator, the incineration/disposal costs would approximately quadruple, to over \$11 million. Although it might be possible to negotiate a lower unit cost, the cost increase would remain extremely high.

5.3.3 Excavation of All Fill Material and Off-site Disposal

Under this alternative, all fill material in the Furnace Courtyard Area would be excavated for off-site disposal. Based on historical data, this would require an excavation depth of approximately 10 feet. because the courtyard is surrounded by buildings, the excavation would require shoring. Samples would be collected from the completed excavation for characterization purposes, but no additional excavation would occur based on the analytical results. The excavation would be backfilled with crushed stone. Because the contaminated material would have been completely removed, no capping would be required.

5.3.3.1 Process Description

The removal/excavation and final off-site disposal of the contaminated soils will consist of the following steps:

- Demolition of building and furnace
- Excavation/transport
- Sampling/analysis (to verify post-removal conditions).
- Off-site treatment/disposal.
- Site restoration.

These steps are described in the following subsections.

Demolition of Building and Furnace

The building would be demolished using heavy equipment, then loaded into dump trucks for disposal at a solid waste landfill. All footings and foundations would be removed and disposed of as hazardous waste. The furnace itself would be dismantled (cut into scrap). No cost has been assumed for the disposal of the furnace; it is assumed this could be sold as scrap metal.

Excavation/Transport

The excavation under this alternative is approximately 10 feet deep. Furthermore, it would be directly adjacent to existing buildings. To prevent undermining the foundations of those buildings, it would be necessary to provide shoring for the excavation, and this shoring must be provided before excavation could begin. Sheet piling would be installed to shore the excavation. A vibratory driver would be used to install the sheet piling in order to prevent damage to adjacent foundations.

The excavation could be complicated by the presence of underground utilities. The extent, if any, of such utilities is unknown, but an allowance will be made in the cost estimate for this alternative for the hand excavation of 10% of the soils.

Sampling/Analysis

Surface soil samples (0-1 feet depth interval) would be collected from six locations. These samples would be analyzed for VOCs, SVOCs, metals, TPH, pesticides/PCBs, and dioxins. This data would provide the basis for a future risk assessment, if required, including modeling of migration potential to groundwater. The results would not be used as a basis for expanding the removal action.

Off-site Treatment/Disposal

The excavated soil would contain a wide range of organic and inorganic contaminants. As explained in Subsection 4.2.1, the lead concentration may result in a classification as characteristic hazardous waste. In order to prevent the stockpiling of material on-site, this would need to be pre-determined (before any excavation activities). Because the lead concentrations in soil are elevated (two concentrations were measured at over 10,000 ppm), it is assumed for the purpose of this EE/CA that the soil would require management as a D008 hazardous waste (TCLP toxic for lead). Therefore, according to the LDR's under RCRA, the soil would require treatment such that the lead concentration in the TCLP extract would be below 5.0 mg/L.

The waste also contains PCBs above 50 ppm, which are regulated under TSCA. PCB contaminated soils above 50 ppm must be disposed of in a TSCA-permitted landfill. Therefore, the landfill accepting the contaminated soil must be permitted under both RCRA and TSCA.

The treatment of the soil to meet the LDR limit for lead would take place at a RCRA permitted facility, probably at the landfill. It would also be possible to treat the soil in situ, then excavate and transport them to a landfill. However in order to minimize disturbances of the dioxin-containing soils, it is assumed that off-site treatment would be performed.

Site Restoration

Site restoration would consist of placement of a uniformly-graded, crushed, granular material in the excavation. Because such material is essentially self-compacting, it can be placed in an excavation containing standing water. This would negate the need to pump accumulated water from the excavation.

5.3.3.2 Effectiveness

This action would effectively reduce the potential for human contact and ecological exposure with the contaminated surface and subsurface soils. Because all contaminated soils would be removed, no future maintenance activities would be required. This action would not preclude any future site actions in regard to groundwater clean-up.

There would be a potential for increased migration due to the implementation of this alternative. Over 5,000 cu. yd. of soil would require excavation, loading, and transport. Although engineering controls would be in place to minimize the migration of contamination, the potential for some degree of migration would nonetheless exist. An Erosion and Sedimentation Control Plan would be developed to prevent migration of contaminated sediments, and dust control measures (using water or foam to control dusting) would likewise be implemented.

5.3.3.3 Implementability

The alternative is readily implementable in a technical sense. Standard earth moving equipment is required and widely available. No permits would be required, unless collected storm water was treated on-site and discharged. Due to the high groundwater table in this area, it is likely that groundwater would collect in the excavation. However, as explained above, the use of a suitable backfill material would negate the need to remove accumulated water.

The site is surrounded by major highways and commercial land (movie theater). However, due to the size of the project, residents in the area may be concerned regarding potential migration of the contamination. Excavation within the courtyard would not be highly visible, but the visibility of the site actions must be viewed as a whole. Concern on the part of the surrounding community should be anticipated, and the engineering/operational controls to prevent migration would need to be explained to the public. As noted in Section 5.3.1, landfill disposal may not be possible if the soil is determined to be a RCRA dioxin-listed hazardous waste.

5.3.3.4 Cost

The cost analysis is shown in Table 5-7. The maintenance cost is based on annual maintenance of the asphalt cap (sealing plus repair of any cracks), for a period of 30 years. The total present worth of this alternative is \$2,694,000. It should be noted that these costs could potentially be changed due to the following factors:

- Classification as a non-hazardous waste. The waste could be determined not to be a hazardous waste. The cost of disposal at a landfill would not be markedly effected by this determination, because it is assumed that due to its CERCLA status and PCB content, the waste would still be sent to a secure landfill. However, this classification would negate the need for treatment prior to disposal, resulting in a savings of \$375,000.
- Classification as a listed RCRA waste. As noted in Section 3.5, there is currently no basis for classifying the site soils as listed RCRA wastes. If the soils were classified as a listed hazardous waste, additional pretreatment might be required.
- Classification as a listed hazardous waste due to dioxin. In this case, incineration would be required as pretreatment. This would increase the cost of disposal (by more than a factor of 10).

5.3.4 Bioventing and Capping

This alternative utilizes in situ treatment technology to remediate the high levels of VOCs present in the soils, and a cap to prevent contact from future workers on the site. It does not involve excavation, except as incidental to implementing the in situ treatment. No additional samples would be collected at this time, but future samples would be collected to determine if the in situ treatment could be terminated. As with the previous alternative, an asphalt cap would be installed to prevent exposures due to dermal contact and inhalation.

During removal activities, erosion and sedimentation (E&S) controls, such as diversion ditches, berms, and silt fencing, will be provided as necessary to prevent off-site migration of contamination. Dust control may also be required.

5.3.4.1 Process Description

The removal action of the contaminated soils will consist of the following steps:

- Demolition of building and furnace.
- Installation of bioventing system.
- Installation of cap.
- Operation/monitoring of bioventing system.

These steps are described in the following subsections.

Demolition of Building and Furnace

This activity would be as described in Section 5.3.1.1, except that no foundations or footings would be removed unless necessary to install the below-grade piping required for this alternative.

Installation of Bioventing System

The actual layout of the bioventing system would be determined during final design, but it is approximated as follows. Other than grading and possible removal of portions of foundations, soil would not be excavated. A layer of uniformly-sized stone would be placed over the soil. A header pipe would be installed on top of the stone, running the length of the courtyard, and perforated lateral pipes would be connected to the header, such that the laterals were approximately 10 feet apart. The stone would serve as bedding material for the piping. Additional stone would then be placed around the pipes, thereby surrounding them within a porous bed. The stone would then be compacted. The water table is very high in this area so a very shallow observation well would be installed to monitor the groundwater elevation. The header pipe would be connected to a blower to induce an air flow through the soil; the blower would be vented through granular activated carbon. Because no soil would be excavated, the ground surface in this area would be raised by about one foot due to the stone base and asphalt cap. Depending on the anticipated usage of this area, this raise in elevation might not be desirable (e.g., could cause drainage problems). If an

increase in elevation were not allowable, the first foot of soil would be removed for off site disposal. However, this EE/CA does not account for any such excavation and off site disposal.

Installation of Cap

The cap would consist of a 1.5-inch binder course of asphalt and a 1-inch top course. The asphalt would be installed tight to the building foundations and sealed with caulking or tar. If this were not possible, a narrow trench would be excavated approximately 4 feet deep around the perimeter and sealed with a cement/bentonite slurry (or similar material). This would be required in order to prevent short-circuiting. The purpose of the system is to induce a flow of soil gas into the stone layer; this would not occur if atmospheric air could also enter the stone. Because the piping would be very shallow, this area would be restricted to a low load-bearing use (no vehicular traffic).

Operation/Monitoring of Bioventing System

The purpose of the induced air flow is to promote biological degradation of the organic contaminants. The air would be withdrawn at a slow rate (to be field determined) for two reasons. First, if too high a vacuum were applied, the level of the groundwater could rise, flooding the stone and drawing water into the blower. Second, if the air flow exceeds the stoichiometric requirements for biodegradation, the VOCs will be stripped as well as degraded. The VOCs detected are generally biodegradable (BTEX), but some chlorinated compounds were detected sporadically. Therefore, the blower will be exhausted through granular activated carbon.

Because the system is designed to biodegrade rather than strip organic compounds, it will not be possible to monitor the gas stream to determine when to terminate operation. Rather, after a predetermined period (assumed to be one year), samples will be collected of the subsurface soils, at points midway between the lateral collection pipes, and analyzed for VOCs. If levels have decreased sufficiently, the operation would be shut down; if not, it would continue until desired levels were achieved. For this EE/CA, it has been assumed that two years of operation will be

required. The groundwater level in the courtyard area would be monitored to prevent operational problems, and the applied vacuum adjusted accordingly.

5.3.4.2 Effectiveness

This action would effectively reduce the potential for human contact and ecological exposure with the contaminated surface soils. As long as the paved area were not disturbed, there would not be a completed pathway for exposure to occur. The potential for wind or storm water erosion would also be eliminated. The potential for infiltration to groundwater would remain, but would be significantly reduced by the in situ biodegradation of the surface soils. This action would not preclude any future site actions in regard to groundwater clean-up.

There are no ARARs for the contaminated soils. Isolating the contaminated soils, in conjunction with biodegradation and institutional controls on future land use, would result in exposures in compliance with the NJDEP guidance's. The site use would not be unrestricted, however, and no activities involving excavation would be allowed unless approved in accordance with the terms of the institutional controls.

There would be no real potential for increased migration due to the implementation of this alternative. The existing soils would not be disturbed, and the concentrations of the most mobile constituents (VOCs) in surface soils would be reduced.

5.3.4.3 Implementability

The alternative is readily implementable in a technical sense. Standard earth-moving and process equipment is required and widely available. It would be necessary to provide a continuous power supply for the blower and to maintain security of the equipment. This would require usage of a small portion of an existing building, or construction of a stand-alone structure. An air emissions permit would be required for exhaust from the granular activated carbon treatment unit, and this could require a three month review. The site is surrounded by major highways and commercial land (movie theater).

However, due to the size of the project, residents in the area may be concerned regarding potential migration of the contamination. The activities within the courtyard would not be highly visible, but the visibility of the site actions must be viewed as a whole. Concern on the part of the surrounding community should be anticipated, and the engineering/operational controls to prevent migration would need to be explained to the public.

5.3.4.4 Cost

The cost analysis is shown in Table 5-8. The maintenance cost is based on operation of the bioventing system for two years, and on annual maintenance of the asphalt cap (sealing plus repair of any cracks), for a period of 30 years. The total present worth of this alternative is \$382,000. It should be noted that the cost of operating the bioventing system could be changed due to the length of operation.

5.3.5 In Situ Stabilization and Capping

This alternative would not involve the excavation or off site disposal of any soils. It would be intended to immobilize the contaminants in the top four feet of soil. No further characterization sampling would be conducted.

During removal activities, erosion and sedimentation (E&S) controls, such as diversion ditches, berms, and silt fencing, will be provided as necessary to prevent off-site migration of contamination. Dust control may also be required.

5.3.5.1 Process Description

The stabilization/capping alternative will consist of:

- Demolition of building and furnace
- Mobilization of stabilization equipment
- In situ stabilization
- Installation of asphalt cap

These operations have been presented in Subsection 5.2.3.1, and will be briefly reviewed. The final cover will utilize bituminous paving rather than soil.

Demolition of Building and Furnace

The building would be demolished using heavy equipment, then loaded into dump trucks for disposal at a solid waste landfill. All footings and foundations would be removed and disposed of as hazardous waste. The furnace itself would be dismantled (cut into scrap). No cost has been assumed for the disposal of the furnace; it is assumed this could be sold as scrap metal.

Mobilization of Stabilization Equipment

Stabilization equipment includes mobile equipment and storage feed equipment for the stabilization reagent. The reagent would typically be stored in a silo, of sufficient capacity to hold a full delivery from a truck. The truck would be unloaded pneumatically, and the silo would have a dust collector at the top. From the silo, the agent would hydraulically conveyed to the stabilization unit. The size of the equipment would depend on whether the Yard Area were also being stabilized. The Furnace Courtyard Area is small in comparison to the Yard Area, and the mobilization effort for just the Furnace Courtyard would be minor.

In Situ Stabilization

The stabilizing agent would be metered into a mixing chamber and mixed with water. It would then be pumped through flexible hoses to the stabilization unit, which would be mounted on an excavator. The stabilization unit consists of a fork-type device, mounted where the excavator bucket would normally be located. Steel pipes convey the stabilizing agent to the tips of the fork, where it is worked into the soil. Any underground utilities within the top four feet would obviously need to be relocated prior to this procedure. A slight volume increase would be realized as a consequence of adding the reagent.

Installation of Final Cover

The final cover would consist of a 1.5-inch binder course of asphalt, overlain by a 1-inch top course. No base of crushed stone would be required because the stabilized soil would have sufficient bearing capacity.

5.3.5.2 Effectiveness

This action would effectively reduce the potential for human contact and ecological exposure with the contaminated surface soils. As long as the cover material were not disturbed, there would not be a completed pathway for exposure to occur. The potential for wind or storm water erosion would also be eliminated. The potential for infiltration to groundwater would remain. However, the most contaminated material would have been stabilized, greatly decreasing the permeability of the soil and, therefore, the degree of infiltration of storm water. Furthermore, the contaminants present in the deeper, unstabilized soils are not highly mobile. This action would essentially preclude future excavation activities at the site in regard to groundwater cleanup or site development, except for minor regrading. Groundwater actions such as pump and treat would not be significantly affected.

There are no ARARs for the contaminated soils. Stabilizing the contaminated materials and covering with clean fill, with institutional controls on future land use, would result in exposures in compliance with the NJDEP guidance's. The site use would not be unrestricted, however, and no activities involving excavation would be allowed unless approved in accordance with the terms of the institutional controls.

There would be some potential for increased migration due to the implementation of this alternative, but the area of disturbance is small, approximately one third acre. The stabilization process would not require excavation of the soil, but would necessitate soil disturbance as the stabilizing agent was mixed with the soil. The mixed soil is a slurry, so there would be no real potential for dusting after the mixing was complete. Dusting potential during the mixing operation would be minimized by wetting the soil

prior to mixing. An Erosion and Sedimentation Control Plan would be developed to prevent migration of contaminated sediments.

5.3.5.3 Implementability

The alternative is readily implementable in a technical sense. The stabilization equipment is proprietary but readily available. Alternative process equipment could also be used. No permits would be required, except for an air permit for emissions from the cement silo during filling operations, and, possibly, for emissions of VOCs during mixing. This could require a review period of up to three months. A treatability study would be required to establish the type and dosage of the stabilization reagent. This could be implemented quickly, and completed in four to six weeks. A permit would also be required for any collected storm water that was treated on-site and discharged. However, it is not expected that this would be necessary. As long as E&S controls were maintained, the storm water runoff should not be any more contaminated than is presently the case. The site is surrounded by major highways and commercial land (movie theater). However, due to the size of the project, residents in the area may be concerned regarding potential migration of the contamination. The activities within the courtyard would not be highly visible, but the visibility of the site actions must be viewed as a whole. Concern on the part of the surrounding community should be anticipated, and the engineering/operational controls to prevent migration would need to be explained to the public.

5.3.5.4 Cost

The cost analysis is shown in Table 5-9. The maintenance cost is based on annual maintenance of the asphalt cap (sealing plus repair of any cracks), for a period of 30 years. The total present worth of this alternative is \$360,000. It should be noted that these costs could potentially be changed due to the following factors:

- Depth of stabilization. A more exact vertical profile could be developed (e.g., results every six inches). This would potentially allow a decreased volume requiring stabilization, with a higher analytical cost.

- Reagent type and quantity. A treatability study would be required to determine the most cost effective stabilization reagent and the required dosage. For this EE/CA, it has been assumed that Portland cement would be used at a dosage of 15% by weight; however, this could either increase or decrease based on the treatability study.

5.3.6 Capping

Capping would not involve excavation or off-site disposal of soils. It would be intended to isolate the contaminants in the soil. No further characterization sampling would be conducted.

5.3.6.1 Process Description

The capping alternative will consist of:

- Demolition of building and furnace
- Installation of geomembrane
- Placement of granular base
- Placement of bituminous cover

Demolition of Building and Furnace

This activity would be as described in Section 5.3.1.1, except that no foundations or footings would be removed unless necessary for the installation of the cap.

Preparation of Subbase

In order to protect the synthetic liner from punctures, a subbase would be prepared and proof rolled. This material must be free of stones or debris that could cause a tear or puncture of the liner. It is possible that the existing site soils would be suitable for this purpose, but this would have to be verified during the design process. Furthermore, some degree of regrading may be necessary to provide positive drainage from the cap. Using a subbase material from an off-site source would allow minor grade changes to be made with the subbase material, rather than disturbing the site soils. Temporary E&S controls would be installed and maintained as necessary.

Installation of Geomembrane

A geomembrane, underlain by a bedding geotextile, would be placed over the prepared subbase. This is commonly a high density polyethylene (HDPE) material (40 mil thickness or greater), but other synthetic materials and thicknesses are also used. A geonet, as was described for the Yard Area cap, would not be required because the asphalt cover would effectively prevent almost all water from infiltrating.

Placement of Asphalt Cover

The cover would consist of an 8-inch granular base, covered by bituminous paving. The paving would consist of a 1.5-inch binder course overlain by a 1-inch top course.

5.3.6.2 Effectiveness

This action would effectively reduce the potential for human contact and ecological exposure with the contaminated surface soils. As long as the cap was not disturbed, there would not be a completed pathway for exposure to occur. The potential for wind or storm water erosion would also be eliminated. The potential for infiltration to groundwater would be essentially eliminated for all material above the water table. This action would essentially preclude future excavation activities in the courtyard area in regard to groundwater cleanup or site development. However, the area would support vehicular traffic. Groundwater actions such as pump and treat or in situ treatment would not be significantly affected. To prevent future disturbances, it would be necessary to relocate (abandon in place) any underground utilities in this area.

There are no ARARs for the contaminated soils. Capping the contaminated materials, with institutional controls on future land use, would result in exposures in compliance with the NJDEP guidance's. The

site use would not be unrestricted, however, and no activities involving excavation would be allowed unless approved in accordance with the terms of the institutional controls.

There would be very little potential for increased migration due to the implementation of this alternative, unless regrading were required to promote drainage. An Erosion and Sedimentation Control Plan would be developed to prevent migration of contaminated sediments.

5.3.6.3 Implementability

The alternative is readily implementable in a technical sense. Capping is a well-established technique and is widely used. A formal engineering design would need to be completed prior to initiating work at the site; this would require approximately six months. No permits would be required for this action, unless any storm water was treated and discharged on site. However, it is not expected that this would be necessary, inasmuch as there would be very little disturbance of the contaminated soils. The site is surrounded by major highways and commercial land (movie theater). However, due to the size of the project, residents in the area may be concerned regarding potential migration of the contamination. The activities within the courtyard would not be highly visible, but the visibility of the site actions must be viewed as a whole. Concern on the part of the surrounding community should be anticipated, and the engineering/operational controls to prevent migration would need to be explained to the public.

5.3.6.4 Cost

The cost analysis is shown in Table 5-10. The maintenance cost is based on annual maintenance of the asphalt cap (sealing plus repair of any cracks), for a period of 30 years. The total present worth of this alternative is \$244,000.

5.4 STORAGE TANK AREA

5.4.1 Excavation and Off-site Disposal

Under this alternative, the existing storage tanks would first be removed. The top four feet of soil in the yard area would then be excavated. This material would be transported to an off-site landfill for disposal. The soils would be removed by mobile earth moving equipment. Following removal, surface soil samples would be collected from the newly exposed soil surface. The purpose of these samples would not be to determine if additional excavation should be conducted, because the removal alternative would not be based on achieving a specific residual concentration in the site soils. Rather, this data would serve to document post-removal site conditions, for consideration in regard to evaluating any further remedial actions on the site.

The Storage Tank Area is relatively small, encompassing approximately one third acre. This removal action would require the excavation and off-site disposal of approximately 2,300 cu. yd. of soil.

During removal activities, erosion and sedimentation (E&S) controls, such as diversion ditches, berms, and silt fencing, will be provided as necessary to prevent off-site migration of contamination. Dust control may also be required.

5.4.1.1 Process Description

The removal/excavation and final off-site disposal of the contaminated soils will consist of the following steps:

- Removal of existing storage tanks
- Excavation/transport
- Sampling/analysis (to verify post-removal conditions).
- Off-site treatment/disposal.
- Site restoration.

These steps are described in the following subsections.

Removal of Existing Storage Tanks

Prior to commencing any work in the Storage Tank Area, the existing tanks in this area, plus a steel trench that connects the Storage Tank Area to the Furnace Courtyard Area, would be removed. The tanks include one aboveground steel tank (18 ft diameter x 60 ft high) and four 5,000-gal underground tanks. Three of the underground tanks are empty; the fourth had previously been empty but now contains water that evidently infiltrated into the tank. The aboveground tank contains seven feet of sludge.

For the removal of the aboveground tank, activities would consist of cutting open the tank, removing the waste, cleaning the tank, cutting the tank into pieces, and disposal of the steel as scrap metal. Cleaning residues would be disposed of as hazardous waste.

The underground tank containing water would be emptied via pumping, and the water (after testing) would be sent to a local sewage treatment plant. The underground tanks and the trench would be excavated, dismantled, cleaned, and disposed of as scrap metal. All cleaning residues would be disposed of as hazardous wastes.

Excavation/Transport

The site soils contain numerous organic and inorganic constituents, including lead, polyaromatic hydrocarbon (PAHs), PCBs, and dioxins. A key objective of any removal action is not to allow the action to result in mobilization of the contaminated media due to dusting or storm water runoff. In order to minimize dusting, the excavated soils would be loaded directly into trucks. No on-site stockpiles would be used. All trucks would be covered with tarps, and tires would be cleaned at a washing station before leaving the site. Following excavation, the exposed soil would be kept moist using a water spray, in order to prevent dusting.

The excavation could be complicated by the presence of underground utilities. The extent, if any, of such utilities is unknown, but an allowance will be made in the cost estimate for this alternative for the hand excavation of 10% of the soils.

Sampling/Analysis

Surface soil samples (0-1 feet depth interval) would be collected from six locations. These samples would be analyzed for VOCs, SVOCs, metals, TPH, pesticides/PCBs, and dioxins. This data would provide the basis for a future risk assessment, if required, including modeling of migration potential to groundwater. The results would not be used as a basis for expanding the removal action.

Off-Site Treatment/Disposal

The excavated soil would contain a wide range of organic and inorganic contaminants. As explained in Subsection 4.2.1, the lead concentration may result in a classification as characteristic hazardous waste. In order to prevent the stockpiling of material on-site, this would need to be pre-determined (before any excavation activities). Because the lead concentrations in soil are elevated (two concentrations were measured at over 10,000 ppm), it is assumed for the purpose of this EE/CA that the soil would require management as a D008 hazardous waste (TCLP toxic for lead). Therefore, according to the LDR's under RCRA, the soil would require treatment such that the lead concentration in the TCLP extract would be below 5.0 mg/L.

The waste also contains PCBs, which are regulated under TSCA. Soils with PCB contamination greater than 50 ppm must be disposed of in a TSCA-permitted landfill. The soils in the Storage Tank Area may exceed this level, although this is not certain. As a conservative assumption, the landfill accepting the contaminated soil must be permitted under both RCRA and TSCA.

The treatment of the soil to meet the LDR limit for lead would take place at a RCRA permitted facility, probably at the landfill. It would also be possible to treat the soils in situ, then excavate and transport

them to a landfill. However in order to minimize disturbances of the dioxin-containing soils, it is assumed that off-site treatment would be performed.

Site Restoration

Site restoration would consist of placement and compaction of clean fill in the excavation, overlain by an 8-inch base of crushed stone. The stone would be covered by a 1.5-inch binder course of asphalt and a 1-inch top course.

5.4.1.2 Effectiveness

This action would effectively reduce the potential for human contact and ecological exposure with the contaminated surface soils. As long as the paved area were not disturbed, there would not be a completed pathway for exposure to occur. The potential for wind or storm water erosion would also be eliminated. The potential for infiltration to groundwater would remain. However, the contaminants detected are not highly mobile (VOCs were low compared to the Furnace Courtyard Area). This action would not preclude any future site actions in regard to groundwater clean-up.

There are no ARARs for the contaminated soils. Removing the contaminated materials and replacement with clean fill, with institutional controls on future land use, would result in exposures in compliance with the NJDEP guidance's. The site use would not be unrestricted, however, and no activities involving excavation would be allowed unless approved in accordance with the terms of the institutional controls. Also, if underground utilities are present in the area, it may be necessary to permanently relocate them so no future excavation would be required.

There would be a potential for increased migration due to the implementation of this alternative. Over 2,500 cu. yd. of soil would require excavation, loading, and transport. Although engineering controls would be in place to minimize the migration of contamination, the potential for some degree of migration would nonetheless exist. An Erosion and Sedimentation Control Plan would be developed to

prevent migration of contaminated sediments, and dust control measures (using water or foam to control dusting) would likewise be implemented.

5.4.1.3 Implementability

The alternative is readily implementable in a technical sense. Standard earth moving equipment is required and widely available. No permits would be required, unless collected storm water was treated on-site and discharged. Due to the high groundwater table in this area, it is likely that groundwater would collect in the excavation. However, because the excavation is of a predetermined depth, (i.e., it would not be necessary to increase the dimensions of the excavation due to sampling results) removal of accumulated groundwater would not necessarily be required. Rather, a uniformly-graded, crushed stone fill could be used below the water table, allowing compaction without dewatering. For the purpose of this EE/CA, it is assumed that crushed stone would be used. The site is surrounded by major highways and commercial land (movie theater). However, residents in the area may be concerned regarding potential migration of the contamination. The Storage Yard Area is visible from the Turnpike. Concern on the part of the surrounding community should be anticipated, and the engineering/operational controls to prevent migration would need to be explained to the public. It is noted that if this material were determined to be a dioxin-listed hazardous waste, it may not be possible to landfill. Incineration would be required as a pretreatment. There is presently only one incinerator in the country (Coffeyville, KS) that is permitted to burn dioxin-listed RCRA hazardous waste, and it is presently scheduled to close in the beginning of 1998 (this closure is not definite).

5.4.1.4 Cost

The cost analysis is shown in Table 5-11. The maintenance cost is based on annual maintenance of the asphalt cap (sealing plus repair of any cracks), for a period of 30 years. The total present worth of this alternative is \$1,206,000. It should be noted that these costs could potentially be changed due to the following factors:

- Depth of excavation. A more exact vertical profile could be developed (e.g., results every six inches). This would potentially allow a decrease volume of excavation, with a higher analytical cost.
- Determination of Hazardous Waste. The waste could be determined not to be a hazardous waste. The cost of disposal at a landfill would not be markedly effected by this determination, but this would negate the need for treatment prior to disposal, resulting in a savings of \$157,000.
- Classification as a listed RCRA waste. As noted in Section 3.5, there is currently no basis for classifying the site soils as listed RCRA wastes. If the soils were classified as a listed hazardous waste, additional pretreatment might be required.
- Classification as a listed hazardous waste due to dioxin. In this case, incineration would be required as pretreatment. Based on an incineration/disposal unit cost of \$4000 per ton at the Coffeyville incinerator, this would increase the cost of disposal (by more than a factor of 10), as noted in Subsection 5.4.2.

5.4.2 Excavation and Off-site Incineration/Disposal

This alternative is identical to that described in Section 5.4.3 (Excavation and Off-site Disposal), except that the soil would be incinerated in order to destroy organic contaminants prior to disposal in a secure landfill.

5.4.2.1 Process Description

The activities under this alternative are identical to those described under section 5.3.1, except that off-site treatment would consist of both incineration and treatment for lead, prior to landfilling.

5.4.2.2 Effectiveness

Insofar as the site is concerned, the effectiveness of this alternative is identical to excavation and off-site disposal (Section 5.4.1). Because it would be incinerated, the organic contaminants would be destroyed rather than immobilized in a secure landfill.

5.2.2.3 Implementability

This alternative is readily implementable. Commercial capacity is available to incinerate this material. It is noted that if this material were determined to be a dioxin-listed hazardous waste, it may not be possible to incinerate. There is presently only one incinerator in the country (Coffeyville, KS) that is permitted to burn dioxin-listed RCRA hazardous waste, and it is presently scheduled to close in the beginning of 1998 (this closure is not definite).

5.4.2.4 Cost

The cost analysis is shown on Table 5-12. The maintenance cost is based on 3% of the capital cost of the site restoration, for a period of 30 years. The total present worth of this alternative is \$4,782,000. It should be noted that these costs could potentially change due to the following factors:

- Depth of excavation. A more exact vertical profile could be developed (e.g., results every six inches). This would potentially allow a decreased volume of excavation, with a higher analytical cost.
- Classification as a non-hazardous waste. The waste could be determined not to be a hazardous waste. The cost of disposal at a landfill would not be markedly effected by this determination, because it is assumed that due to its CERCLA status and PCB content, the waste would still be sent to a secure landfill. However, this classification would negate the need for treatment prior to disposal, resulting in a savings of \$157,000.
- Classification as a listed RCRA waste. As noted in Section 3.5, there is currently no basis for classifying the site soils as listed RCRA wastes. If the soils were classified as a listed hazardous waste, additional pretreatment might be required.
- Classification as a listed hazardous waste due to dioxin. In this case, incineration would be required as pretreatment. Based on an incineration/disposal unit cost of \$4000 per ton at the Coffeyville incinerator, the incineration/disposal costs would approximately quadruple, to over \$12 million. Although it might be possible to negotiate a lower unit cost, the cost increase would remain extremely high.

5.4.3 In Situ Stabilization and Capping

This alternative would not involve the excavation or off site disposal of any soils, except as required for removal of the existing storage tanks and steel trench. It would be intended to immobilize the contaminants in the top four feet of soil. No further characterization sampling would be conducted.

During removal activities, erosion and sedimentation (E&S) controls, such as diversion ditches, berms, and silt fencing, will be provided as necessary to prevent off-site migration of contamination. Dust control may also be required.

5.4.3.1 Process Description

The stabilization/capping alternative will consist of:

- Removal of existing storage tanks
- Mobilization of stabilization equipment
- In situ stabilization
- Installation of asphalt cap

These operations have been presented in Subsection 5.2.2.1, and will be briefly reviewed. The final cover will utilize bituminous paving rather than soil.

Removal of Existing Storage Tanks

Prior to commencing any work in the Storage Tank Area, the existing tanks in this area, plus a steel trench that connects the Storage Tank Area to the Furnace Courtyard Area, would be removed. The tanks include one aboveground steel tank (18 ft diameter x 60 ft high) and four 5,000-gal underground tanks. Three of the underground tanks are empty; the fourth had previously been empty but now contains water that evidently infiltrated into the tank. The aboveground tank contains seven feet of sludge.

For the removal of the aboveground tank, activities would consist of cutting open the tank, removing the waste, cleaning the tank, cutting the tank into pieces, and disposal of the steel as scrap metal. Cleaning residues would be disposed of as hazardous waste.

The underground tank containing water would be emptied via pumping, and the water (after testing) would be sent to a local sewage treatment plant. The underground tanks and the trench would be excavated, dismantled, cleaned, and disposed of as scrap metal. All cleaning residues would be disposed of as hazardous wastes.

Mobilization of Stabilization Equipment

Stabilization equipment includes mobile equipment and storage feed equipment for the stabilization reagent. The reagent would typically be stored in a silo, of sufficient capacity to hold a full delivery from a truck. The truck would be unloaded pneumatically, and the silo would have a dust collector at the top. From the silo, the agent would be hydraulically conveyed to the stabilization unit. The size of the equipment would depend on whether the Yard Area were also being stabilized. The Storage Tank Area is small in comparison to the Yard Area, and the mobilization effort for just the Furnace Courtyard would be minor.

In-Site Stabilization

The stabilizing agent would be metered into a mixing chamber and mixed with water. It would then be pumped through flexible hoses to the stabilization unit, which would be mounted on an excavator. The stabilization unit consists of a fork-type device, mounted where the excavator bucket would normally be located. Steel pipes convey the stabilizing agent to the tips of the fork, where it is worked into the soil. Any underground utilities within the top four feet would obviously need to be relocated prior to this procedure. A slight volume increase would be realized as a consequence of adding the reagent.

Installation of Final Cover

The final cover would consist of a 1.5-inch binder course of asphalt, overlain by a 1-inch top course. No base of crushed stone would be required because the stabilized soil would have sufficient bearing capacity.

5.4.3.2 Effectiveness

This action would effectively reduce the potential for human contact and ecological exposure with the contaminated surface soils. As long as the cover material were not disturbed, there would not be a completed pathway for exposure to occur. The potential for wind or storm water erosion would also be eliminated. The potential for infiltration to groundwater would remain. However, the most contaminated material would have been stabilized, greatly decreasing the permeability of the soil and, therefore, the degree of infiltration of storm water. Furthermore, the contaminants present in the deeper, unstabilized soils are not highly mobile. This action would essentially preclude future excavation activities at the site in regard to groundwater cleanup or site development, except for minor regrading. Groundwater actions such as pump and treat would not be significantly affected.

There are no ARARs for the contaminated soils. Stabilizing the contaminated materials and covering with clean fill, with institutional controls on future land use, would result in exposures in compliance with the NJDEP guidance's. The site use would not be unrestricted, however, and no activities involving excavation would be allowed unless approved in accordance with the terms of the institutional controls.

There would be some potential for increased migration due to the implementation of this alternative, but the area of disturbance is small, approximately one third acre. The stabilization process would not require excavation of the soil, but would necessitate soil disturbance as the stabilizing agent was mixed with the soil. The mixed soil is a slurry, so there would be no real potential for dusting after the mixing was complete. Dusting potential during the mixing operation would be minimized by wetting the soil

prior to mixing. An Erosion and Sedimentation Control Plan would be developed to prevent migration of contaminated sediments.

5.4.3.3 Implementability

The alternative is readily implementable in a technical sense. The stabilization equipment is proprietary but readily available. Alternative process equipment could also be used. No permits would be required, except for an air permit for emissions from the cement silo during filling operations. This could require a review period of up to three months. A treatability study would be required to establish the type and dosage of the stabilization reagent. This could be implemented quickly, and completed in four to six weeks. A permit would also be required for any collected storm water that was treated on-site and discharged. However, it is not expected that this would be necessary. As long as E&S controls were maintained, the storm water runoff should not be any more contaminated than is presently the case. The site is surrounded by major highways and commercial land (movie theater). However, due to the size of the project, residents in the area may be concerned regarding potential migration of the contamination. However, residents in the area may be concerned regarding potential migration of the contamination. The Storage Yard Area is visible from the Turnpike. Concern on the part of the surrounding community should be anticipated, and the engineering/operational controls to prevent migration would need to be explained to the public.

5.4.3.4 Cost

The cost analysis is shown in Table 5-13. The maintenance cost is based on annual maintenance of the asphalt cap (sealing plus repair of any cracks), for a period of 30 years. The total present worth of this alternative is \$316,000. It should be noted that these costs could potentially be changed due to the following factors:

- Depth of stabilization. A more exact vertical profile could be developed (e.g., results every six inches). This would potentially allow a decreased volume requiring stabilization, with a higher analytical cost.

- Reagent type and quantity. A treatability study would be required to determine the most cost effective stabilization reagent and the required dosage. For this EE/CA, it has been assumed that Portland cement would be used at a dosage of 15% by weight; however, this could either increase or decrease based on the treatability study.

5.4.4 Capping

Capping would not involve excavation or off-site disposal of soils, except as required for the removal of the existing storage tanks and pipe trench. It would be intended to isolate the contaminants in the soil. No further characterization sampling would be conducted.

5.4.4.1 Process Description

The capping alternative will consist of:

- Removal of existing storage tanks
- Preparation of subbase
- Installation of geomembrane
- Placement of bituminous cover

Removal of Existing Storage Tanks

Prior to commencing any work in the Storage Tank Area, the existing tanks in this area, plus a steel trench that connects the Storage Tank Area to the Furnace Courtyard Area, would be removed. The tanks include one aboveground steel tank (18 ft diameter x 60 ft high) and four 5,000-gal underground tanks. Three of the underground tanks are empty; the fourth had previously been empty but now contains water that evidently infiltrated into the tank. The aboveground tank contains seven feet of sludge.

For the removal of the aboveground tank, activities would consist of cutting open the tank, removing the waste, cleaning the tank, cutting the tank into pieces, and disposal of the steel as scrap metal. Cleaning residues would be disposed of as hazardous waste.

The underground tank containing water would be emptied via pumping, and the water (after testing) would be sent to a local sewage treatment plant. The underground tanks and the trench would be excavated, dismantled, cleaned, and disposed of as scrap metal. All cleaning residues would be disposed of as hazardous wastes.

Preparation of Subbase

In order to protect the synthetic liner from punctures, a subbase would be prepared and proof rolled. This material must be free of stones or debris that could cause a tear or puncture of the liner. It is possible that the existing site soils would be suitable for this purpose, but this would have to be verified during the design process. Furthermore, some degree of regrading may be necessary to provide positive drainage from the cap. Using a subbase material from an off-site source would allow minor grade changes to be made with the subbase material, rather than disturbing the site soils. Temporary E&S controls would be installed and maintained as necessary.

Installation of Geomembrane

A geomembrane, underlain by a bedding geotextile, would be placed over the prepared subbase. This is commonly a high density polyethylene (HDPE) material (40 mil thickness or greater), but other synthetic materials and thicknesses are also used. A geonet, as was described for the Yard Area cap, would not be required because the asphalt cover would effectively prevent almost all water from infiltrating.

Placement of Asphalt Cover

The cover would consist of an 8-inch granular base, covered by bituminous paving. The paving would consist of a 1.5-inch binder course overlain by a 1-inch top course.

5.4.4.2 Effectiveness

This action would effectively reduce the potential for human contact and ecological exposure with the contaminated surface soils. As long as the cap was not disturbed, there would not be a completed pathway for exposure to occur. The potential for wind or storm water erosion would also be eliminated. The potential for infiltration to groundwater would be essentially eliminated for all material above the water table. This action would essentially preclude future excavation activities in the Storage Yard Area in regard to groundwater cleanup or site development. However, the area would support vehicular traffic. Groundwater actions such as pump and treat or in situ treatment would not be significantly affected. To prevent future disturbances, it would be necessary to relocate (abandon in place) any underground utilities in this area.

There are no ARARs for the contaminated soils. Capping the contaminated materials, with institutional controls on future land use, would result in exposures in compliance with the NJDEP guidance's. The site use would not be unrestricted, however, and no activities involving excavation would be allowed unless approved in accordance with the terms of the institutional controls.

There would be very little potential for increased migration due to the implementation of this alternative, unless regrading were required to promote drainage. An Erosion and Sedimentation Control Plan would be developed to prevent migration of contaminated sediments.

5.4.4.3 Implementability

The alternative is readily implementable in a technical sense. Capping is a well-established technique and is widely used. A formal engineering design would need to be completed prior to initiating work at the site; this would require approximately six months. No permits would be required for this action, unless any storm water was treated and discharged on site. However, it is not expected that this would be necessary, inasmuch as there would be very little disturbance of the contaminated soils. The site is surrounded by major highways and commercial land (movie theater). However, due to the size of the project, residents in the area may be concerned regarding potential migration of the contamination. The

Storage Yard Area is visible from the Turnpike. Concern on the part of the surrounding community should be anticipated, and the engineering/operational controls to prevent migration would need to be explained to the public.

5.4.4.4 Cost

The cost analysis is shown in Table 5-13. The maintenance cost is based on annual maintenance of the asphalt cap (sealing plus repair of any cracks), for a period of 30 years. The total present worth of this alternative is \$212,000.

TABLE 5-1

ESTIMATED COSTS FOR YARD AREA

EXCAVATION AND OFF-SITE DISPOSAL

Cost Item	Quantity	Unit Cost \$	Amount \$
Capital Costs			
Mobilization/Demobilization		Lump Sum	50,000
Construction facilities (3 months)		Lump Sum	45,000
Survey		Lump Sum	20,000
Clearing and grubbing, light	11.3 acres	2,200	24,860
E&S Controls		Lump Sum	20,000
Site Access Roads (3000 LF x 20 ft. wide)	6,670 sq yd	11.00	73,370
Excavation/Loading, Machine	68,000 cu yd	5.00	340,000
Excavation/Loading, Hand	5,000 cu yd	17.25	86,250
Dust Control		Lump Sum	30,000
Post-excavation Sampling		Lump Sum	5,000
Sample Analysis	50 samples	900	45,000
Transportation	94,900 tons	54.00	5,124,600
Disposal	94,900 tons	143.60	13,627,640
Imported Fill Material	35,590 tons	6.75	240,233
Imported Top Soil Material	11,860 tons	12.00	142,320
Placement/Compaction of Fill	36,500 cu yd	8.15	297,475
Hydromulching	11.3 acres	3,200	36,160
Deed Restriction		Lump Sum	10,000
Total Capital Costs			20,217,908
Operating Costs			
Cap Maintenance	11.3 acres	300 acre yr	3,390
Present Worth (Based on 30 yrs @ 7% interest)			42,067
Subtotal			20,259,974
Administrative, Engineering, & Construction Services (25%)			5,064,994
Contingency (15% of Subtotal Plus Administration)			3,798,745
Total (Rounded)			29,124,000

TABLE 5-2

ESTIMATED COSTS FOR YARD AREA

EXCAVATION AND OFF-SITE INCINERATION/DISPOSAL

Cost Item	Quantity	Unit Cost \$	Amount \$
Capital Costs			
Mobilization/Demobilization		Lump Sum	50,000
Construction facilities (3 months)		Lump Sum	45,000
Survey		Lump Sum	20,000
Clearing and grubbing, light	11.3 acres	2,200	24,860
E&S Controls		Lump Sum	20,000
Site Access Roads (3000 LF x 20 ft. wide)	6,670 sq yd	11.00	73,370
Excavation/Loading	73,000 cu yd	5.00	365,000
Dust Control		Lump Sum	30,000
Post-excavation Sampling		Lump Sum	5,000
Sample Analysis	50 samples	900	45,000
Transportation	94,900 tons	54.00	5,124,600
Disposal	94,900 tons	946.00	89,775,400
Imported Fill Material	35,590 tons	6.75	240,233
Imported Top Soil Material	11,860 tons	12.00	142,320
Placement/Compaction of Fill	36,500 cu yd	8.15	297,475
Hydromulching	11.3 acres	3,200	36,160
Deed Restriction		Lump Sum	10,000
Total Capital Costs			96,304,418
Operating Costs			
Cap Maintenance	11.3 acres	300 acre yr	3,390
Present Worth (Based on 30 yrs @ 7% interest)			42,067
Subtotal			96,346,484
Administrative, Engineering, & Construction Services (25%)			24,086,621
Contingency (15% of Subtotal Plus Administration)			18,064,966
Total (Rounded)			138,498,000

TABLE 5-3

ESTIMATED COSTS FOR YARD AREA

IN-SITU STABILIZATION

Cost Item	Quantity	Unit Cost \$	Amount \$
Capital Costs			
Mobilization/Demobilization		Lump Sum	30,000
Construction facilities (3 months)		Lump Sum	45,000
Survey		Lump Sum	20,000
Clearing and grubbing, light	11.3 acres	2,200	24,860
E&S Controls		Lump Sum	20,000
Site Access Roads (300 LF x 20 ft. wide)	670 sq yd	11.00	7,370
Permitting		Lump Sum	10,000
Stabilization	73,000 cu yd	40.00	2,920,000
Imported Fill Material 18"	35,590 tons	6.75	240,233
Imported Top Soil Material 6"	11,860 tons	12.00	142,320
Placement/Compaction of Fill	36,500 tons	8.15	297,475
Hydromulching	11.3 acres	3,200	36,160
Deed Restriction		Lump Sum	10,000
Total Capital Costs			3,803,418
Operating Costs			
Cap Maintenance	11.3 acres	\$300/ac/yr	3,390
Present Worth (Based on 30 yrs @ 7% interest)			42,067
Subtotal			3,845,484
Administrative, Engineering, & Construction Services (25%)			961,371
Contingency (15% of Subtotal Plus Administration)			721,028
Total (Rounded)			5,528,000

TABLE 5-4
ESTIMATED COSTS FOR YARD AREA

CAPPING ALTERNATIVE

Cost Item	Quantity	Unit Cost \$	Amount \$
Capital Costs			
Mobilization/Demobilization		Lump Sum	50,000
Construction facilities (3 months)		Lump Sum	45,000
Survey		Lump Sum	20,000
Clearing and grubbing, light	11.3 acres	2,200	24,860
E&S Controls		Lump Sum	20,000
Site Access Roads (1000 LF x 20 ft. wide)	2,220 sq yd	11.00	24,420
Imported Fill Subbase	11,860 tons	6.75	80,055
Geosynthetics	18,200 sq yd	16.00	291,200
Imported Fill Material	35,590 tons	6.75	240,233
Imported Top Soil Material	11,860 tons	12.00	142,320
Placement/Compaction of Fill	36,500 cu yd	8.15	297,475
Hydromulching	11.3 acres	3,200	36,160
Deed Restriction		Lump Sum	10,000
Total Capital Costs			1,281,723
Operating Costs			
Cap Maintenance	11.3 acres	\$300/ac/yr	3,390
Present Worth (Based on 30 yrs @ 7% interest)			42,067
Subtotal			1,323,789
Administrative, Engineering, & Construction Services (25%)			330,947
Contingency (15% of Subtotal Plus Administration)			248,210
Total (Rounded)			1,903,000

TABLE 5-5

ESTIMATED COSTS FOR FURNACE COURTYARD AREA

EXCAVATION AND OFF-SITE DISPOSAL

Cost Item	Quantity	Unit Cost \$	Amount \$
Capital Costs			
Mobilization/Demobilization		Lump Sum	50,000
Construction facilities (3 months)		Lump Sum	15,000
Survey		Lump Sum	1,000
Demolition of Building and Furnance		Lump Sum	50,000
Disposal of Demolition Waste		Lump Sum	30,000
Excavation/Loading, Machine	2,043 cu yd	5.00	10,215
Excavation/Loading, Hand	227 cu yd	17.25	3,916
Post-excavation Sampling		Lump Sum	1,000
Sample Analysis	6 samples	900	5,400
Transportation	2,950 tons	54.00	159,300
Disposal	2,950 tons	143.60	423,620
Imported Fill Material	2,210 tons	6.75	14,918
Placement/Compaction of Fill	1,700 cu yd	8.15	13,855
Stone Subbase	530 tons	8.25	4,373
Bituminous Concrete Paving	1,700 sq yd	17.00	
Deed Restrictions		Lump Sum	10,000
Total Capital Costs			792,596
Operating Costs			
Cap Maintenance		Lump Sum/yr	1,000
Present Worth (Based on 30 yrs @ 7% interest)			12,409
Subtotal			805,005
Administrative, Engineering, & Construction Services (25%)			201,251
Contingency (15% of Subtotal Plus Administration)			150,938
Total (Rounded)			1,157,000

TABLE 5-6

ESTIMATED COSTS FOR FURNACE COURTYARD AREA

EXCAVATION AND OFF-SITE INCINERATION/DISPOSAL

Cost Item	Quantity	Unit Cost \$	Amount \$
Capital Costs			
Mobilization/Demobilization		Lump Sum	50,000
Construction facilities (1 month)		Lump Sum	15,000
Survey		Lump Sum	1,000
Demolition of Building and Furnance		Lump Sum	50,000
Disposal of Demolition Waste		Lump Sum	30,000
Excavation/Loading, Machine	2,043 cu yd	5.00	10,215
Excavation/Loading, Hand	227 cu yd	17.25	3,916
Post-excavation Sampling		Lump Sum	1,000
Sample Analysis	6 samples	900	5,400
Transportation	2,950 tons	54.00	159,300
Disposal	2,950 tons	946.00	2,790,700
Imported Fill Material	2,210 tons	6.75	14,918
Placement/Compaction of Fill	1,700 cu yd	8.15	13,855
Stone Subbase	530 tons	8.25	4,373
Bituminous Concrete Paving	1,700 sq yd	17.00	
Deed Restrictions		Lump Sum	10,000
Total Capital Costs			3,159,676
Operating Costs			
Cap Maintenance		Lump Sum/yr	1,000
Present Worth (Based on 30 yrs @ 7% interest)			12,409
Subtotal			3,172,085
Administrative, Engineering, & Construction Services (25%)			793,021
Contingency (15% of Subtotal Plus Administration)			594,766
Total (Rounded)			4,560,000

TABLE 5-7

ESTIMATED COSTS FOR FURNACE COURTYARD AREA

EXCAVATION OF ALL FILL MATERIAL AND OFF-SITE DISPOSAL

Cost Item	Quantity	Unit Cost \$	Amount \$
Capital Costs			
Mobilization/Demobilization		Lump Sum	50,000
Construction facilities (1 month)		Lump Sum	15,000
Survey		Lump Sum	1,000
Demolition of Building Furnance		Lump Sum	50,000
Demolition of Building Furnance		Lump Sum	30,000
Installation of Sheet Piling	9290 ft ²	18.00	167,220
Excavation/Loading, Machine	2,043 cu yd	5.00	10,215
Excavation/Loading, Hand	75 cu yd	17.25	1,294
Post-excavation Sampling		Lump Sum	1,000
Sample Analysis	6 samples	900	5,400
Transportation	7,380 tons	54.00	398,520
Disposal	7,380 tons	143.60	1,059,768
Imported Crushed Stone Fill Material	7,945 tons	8.25	65,546
Placement Fill	1,700 cu yd	4.00	6,800
Total Capital Costs			1,861,763
Operating Costs			
Cap Maintenance		Lump Sum/yr	1,000
Present Worth (Based on 30 yrs @ 7% interest)			12,409
Subtotal			1,874,172
Administrative, Engineering, & Construction Services (25%)			468,543
Contingency (15% of Subtotal Plus Administration)			351,407
Total (Rounded)			2,694,000

TABLE 5-8

ESTIMATED COSTS FOR FURNACE COURTYARD AREA

BIOVENTING WITH ASPHALT COVER

Cost Item	Quantity	Unit Cost \$	Amount \$
Capital Costs			
Mobilization/Demobilization		Lump Sum	2,000
Construction facilities (1 month)		Lump Sum	15,000
Survey		Lump Sum	1,000
Permitting		Lump Sum	10,000
Demolition of Building Furnance		Lump Sum	50,000
Disposal of Demolition Waste		Lump Sum	30,000
Stone (12 inches)	790 tons	8.25	6,518
Blower & Activated Carbon (include start-up)		Lump Sum	40,000
Bituminous Concrete Paving	1,700 sq yd	17.00	28,900
Deed Restriction		Lump Sum	1,000
Piping (400 LF Header, 1,200 LF Laterals)		Lump Sum	13,000
Total Capital Costs			197,418
Operating Costs			
Bioventing (2 years)		Lump Sum/yr	31,000
Cap Maintenance (30 years)		Lump Sum/yr	1,000
Present Worth (Based @ 7% interest)			68,457
Subtotal			265,875
Administrative, Engineering, & Construction Services (25%)			66,469
Contingency (15% of Subtotal Plus Administration)			49,851
Total (Rounded)			382,000

TABLE 5-9

ESTIMATED COSTS FOR FURNACE COURTYARD AREA

IN-SITU STABILIZATION

Cost Item	Quantity	Unit Cost \$	Amount \$
Capital Costs			
Mobilization/Demobilization		Lump Sum	2,000
Construction facilities (1 month)		Lump Sum	15,000
Survey		Lump Sum	1,000
Permitting		Lump Sum	10,000
Demolition of Building Furnance		Lump Sum	50,000
Disposal of Demolition Waste		Lump Sum	30,000
Stabilization	2,270 cu yd	40.00	90,800
Bituminous Concrete Paving	1,700 sq yd	17.00	28,900
Deed Restriction		Lump Sum	10,000
Total Capital Costs			237,700
Operating Costs			
Cap Maintenance (30 years)		Lump Sum/yr	1,000
Present Worth (Based @ 7% interest)			12,409
Subtotal			250,109
Administrative, Engineering, & Construction Services (25%)			62,527
Contingency (15% of Subtotal Plus Administration)			46,895
Total (Rounded)			360,000

TABLE 5-10

ESTIMATED COSTS FOR FURNACE COURTYARD AREA

CAPPING

Cost Item	Quantity	Unit Cost \$	Amount \$
Capital Costs			
Mobilization/Demobilization		Lump Sum	2,000
Construction facilities (1 month)		Lump Sum	15,000
Survey		Lump Sum	1,000
Demolition of Building Furnance		Lump Sum	50,000
Disposal of Demolition Waste		Lump Sum	30,000
Membrane Subbase (6")	370 tons	6.75	2,498
Geomembranes	1,700 sq yd	8.00	13,600
Paving Subbase (8")	530 tons	8.25	4,373
Bituminous Paving	1,700 sq yd	17.00	28,900
Deed Restriction		Lump Sum	10,000
Total Capital Costs			157,370
Operating Costs			
Cap Maintenance		Lump Sum/yr	1,000
Present Worth (Based on 30 yrs @ 7% interest)			12,409
Subtotal			169,779
Administrative, Engineering, & Construction Services (25%)			42,445
Contingency (15% of Subtotal Plus Administration)			31,834
Total (Rounded)			244,000

TABLE 5-11

ESTIMATED COSTS FOR STORAGE TANK AREA

EXCAVATION AND OFF-SITE DISPOSAL ALTERNATIVE

Cost Item	Quantity	Unit Cost \$	Amount \$
Capital Costs			
Mobilization/Demobilization		Lump Sum	2,000
Construction facilities (1 month)		Lump Sum	15,000
Survey		Lump Sum	1,000
Removal of Waste & Topple AG Tank		Lump Sum	10,000
Cleaning of AG Tank	3645 ft ²	1.00	3,645
Dismantling/Removal of AG Tank		Lump Sum	6,000
Removal, Cleaning & Disposal of USTs	4 tanks	6,500.00	26,000
Removal, Cleaning & Disposal of Steel Trench		Lump Sum	8,000
E&S Controls		Lump Sum	2,000
Excavation/Loading, Machine	2,115 cu yd	5.00	10,575
Excavation/Loading, Hand	235 cu yd	17.25	4,054
Post-excavation Sampling		Lump Sum	1,000
Sample Analysis	6 samples	900.00	5,400
Transportation (includes AG Tank Residue)	3,145 tons	55.00	172,975
Disposal (includes AG Tank Residue)	3,145 tons	154.20	484,959
Imported Fill Material	2,290 tons	6.75	15,458
Placement/Compaction of Fill	1,760 cu yd	8.15	14,344
Stone Subbase (8")	550	8.25	4,538
Bituminous Concrete Paving	1,760	17.00	29,920
Deed Restriction		Lump Sum	10,000
Total Capital Costs			826,867
Operating Costs			
Cap Maintenance		Lump Sum/yr	1,000
Present Worth (Based on 30 yrs @ 7% interest)			12,409
Subtotal			839,276
Administrative, Engineering, & Construction Services (25%)			209,819
Contingency (15% of Subtotal Plus Administration)			157,364
Total (Rounded)			1,206,000

TABLE 5-12

ESTIMATED COSTS FOR STORAGE TANK AREA

EXCAVATION AND OFF-SITE INCINERATION/DISPOSAL

Cost Item	Quantity	Unit Cost \$	Amount \$
Capital Costs			
Mobilization/Demobilization		Lump Sum	2,000
Construction facilities (1 month)		Lump Sum	15,000
Removal of Waste & Topple AG Tank		Lump Sum	10,000
Cleaning of AG Tank	3645 ft ²	1.00	3,645
Dismantling/Removal of AG Tank		Lump Sum	6,000
Removal, Cleaning & Disposal of USTs	4 tanks	6,500.00	26,000
Removal, Cleaning & Disposal of Steel Trench		Lump Sum	8,000
Survey		Lump Sum	1,000
E&S Controls		Lump Sum	2,000
Excavation/Loading, Machine	2,115 cu yd	5.00	10,575
Excavation/Loading, Hand	235 cu yd	17.25	4,054
Post-excavation Sampling		Lump Sum	1,000
Sample Analysis	6 samples	900.00	5,400
Transportation (includes AG Tank Residue)	3,145 tons	55.00	172,975
Disposal (includes AG Tank Residue)	3,145 tons	945.00	2,972,025
Imported Fill Material	2,290 tons	6.75	15,458
Placement/Compaction of Fill	1,760 cu yd	8.15	14,344
Stone Subbase (8")	550	8.25	4,538
Bituminous Concrete Paving	1,760	17.00	29,920
Deed Restriction		Lump Sum	10,000
Total Capital Costs			3,313,933
Operating Costs			
Cap Maintenance		Lump Sum/yr	1,000
Present Worth (Based on 30 yrs @ 7% interest)			12,409
Subtotal			3,326,342
Administrative, Engineering, & Construction Services (25%)			831,585
Contingency (15% of Subtotal Plus Administration)			623,689
Total (Rounded)			4,782,000

TABLE 5-13

ESTIMATED COSTS FOR STORAGE TANK AREA

IN-SITU STABILIZATION

Cost Item	Quantity	Unit Cost \$	Amount \$
Capital Costs			
Mobilization/Demobilization		Lump Sum	2,000
Construction facilities (1 month)		Lump Sum	15,000
Survey		Lump Sum	1,000
Permitting		Lump Sum	10,000
E&S Control		Lump Sum	2,000
Removal of Waste & Topple AG Tank		Lump Sum	10,000
Cleaning of AG Tank	3645 ft ²	1.00	3,645
Dismantling/Removal of AG Tank		Lump Sum	6,000
Removal, Cleaning & Disposal of USTs	4 tanks	6,500.00	26,000
Removal, Cleaning & Disposal of Steel Trench		Lump Sum	8,000
Stabilization	2,350 cu yd	40.00	94,000
Bituminous Concrete Paving	1,760 sq yd	17.00	29,920
Deed Restriction		Lump Sum	10,000
Total Capital Costs			207,565
Operating Costs			
Cap Maintenance		Lump Sum/yr	1,000
Present Worth (Based on 30 yrs @ 7% interest)			12,409
Subtotal			219,974
Administrative, Engineering, & Construction Services (25%)			54,994
Contingency (15% of Subtotal Plus Administration)			41,245
Total (Rounded)			316,000

TABLE 5-14

ESTIMATED COSTS FOR STORAGE TANK AREA

CAPPING

Cost Item	Quantity	Unit Cost \$	Amount \$
Capital Costs			
Mobilization/Demobilization		Lump Sum	2,000
Construction facilities (1 month)		Lump Sum	15,000
Survey		Lump Sum	1,000
E&S Controls		Lump Sum	2,000
Removal of Waste & Topple AG Tank		Lump Sum	10,000
Cleaning of AG Tank	3645 ft ²	1.00	3,645
Dismantling/Removal of AG Tank		Lump Sum	6,000
Removal, Cleaning & Disposal of USTs	4 tanks	6,500.00	26,000
Removal, Cleaning & Disposal of Steel Trench		Lump Sum	8,000
Membrane Subbase (6")	380 tons	6.75	2,565
Geomembranes	1,760 sq yd	8.00	14,080
Paving Subbase (8")	550 tons	8.25	4,538
Bituminous Paving	1,760 sq yd	17.00	29,920
Deed Restriction		Lump Sum	10,000
Total Capital Costs			134,748
Operating Costs			
Cap Maintenance		Lump Sum/yr	1,000
Present Worth (Based on 30 yrs @ 7% interest)			12,409
Subtotal			147,157
Administrative, Engineering, & Construction Services (25%)			36,789
Contingency (15% of Subtotal Plus Administration)			27,592
Total (Rounded)			212,000

SECTION 6

COMPARATIVE ANALYSIS OF REMOVAL ALTERNATIVES

In this section, information from the previous section is used to compare the alternatives for the three site areas on the bases of effectiveness, implementability, and cost. Each site area is discussed separately.

6.1 YARD AREA

6.1.1 Effectiveness

All four alternatives (excavation, incineration, stabilization, capping) would be effective in achieving the remedial action objectives of preventing human/ecological exposure and minimizing impact to groundwater. The removal and stabilization systems are less dependent on institutional controls, but none of the alternatives results in unrestricted site use. Excavation would have the most potential for short term health impacts, primarily to site workers, although these could be adequately controlled. The short term impacts due to capping and stabilization would depend on the amount of regrading and trenching (for anchoring the cap and promoting drainage). This could not be determined until final design, but the degree of site disturbance should be far less than with excavation. In any case, engineering controls could be provided to mitigate impacts. Incineration is the only alternative that would destroy the organic contaminants. It would not affect the inorganic contaminants.

6.1.2 Implementability

All four alternatives are readily implementable. A pilot test would be required for the stabilization option. All would require a final design in order to implement. The cap design would be somewhat more involved than the design for excavation or stabilization, but would nonetheless be straightforward. Removal options are, in general, more popular with area residents than isolation.

However, there are no residences adjacent to this site. The removal action would have the highest visibility, and would require strict washing/inspection procedures for trucks to prevent soil from being spread on highways from truck tires. The presence of natural gas pipelines would not prevent the alternatives from being implemented, but would have to be considered in the design process. Excavation near the pipeline would require careful monitoring and considerable manual labor. It is not expected that the soils in the immediate vicinity of the pipelines would be stabilized, because this would hamper future maintenance operations on the pipelines. The cap would be installed over the pipelines, but might have to be temporarily removed in localized areas requiring maintenance. Classification of the site soils as a RCRA listed hazardous waste due to dioxin could preclude the off-site disposal alternatives. Incineration would be required, and the only permitted dioxin incinerator in the country is scheduled to close in 1998. However, this closure is not definite.

6.1.3 Cost

The costs of the excavation alternative (\$29 million) greatly exceeds both capping and stabilization. Capping and stabilization are in the same order of magnitude, but stabilization (\$5.5 million) is over twice the cost of capping (\$1.9 million). The cost of incineration (\$138 million) far exceeds even the cost of the excavation alternative.

6.2 FURNACE COURTYARD AREA

6.2.1 Effectiveness

All six alternatives (excavation, incineration, removal of all fill, bioventing, stabilization, and capping) would effectively prevent human/ecological exposure to site contaminants. Capping would provide the least protection of groundwater. The water table is very high in this area, and, even if there were a cap, the water table could potentially rise into the contaminated soil. The excavation and stabilization options both address the first four feet of soil and would therefore be

more effective. The complete removal of all fill would be the most effective alternative and would not require post-removal maintenance. The bioventing alternative would degrade compounds in the unsaturated zone. However if the water table were closer than four feet to the ground surface, it would be less effective than excavation or stabilization. Over time, the bioventing system should prove effective, but it would not achieve as complete a removal as excavation.

As with the Yard Area, the excavation alternative would present the highest potential for contaminant migration, and stabilization would also result in disturbance of the soil, but to a lesser degree. Engineering controls would be required to minimize contaminant migration for both of these alternatives. Capping should not require soil disturbance, assuming utilities, if present, could be abandoned in place and fill material were used to provide positive drainage. Incineration and bioventing are the only alternatives that would destroy organic contaminants, although neither would affect inorganics. Incineration would achieve a much more complete destruction of organics than bioventing, especially for chlorinated compounds.

6.2.2 Implementability

All alternatives are readily implementable. The bioventing and stabilization alternatives would require air emissions permits. A hazardous waste determination would be required for the soil for the excavation alternative. The site is not currently occupied; therefore, power supply and security for the bioventing blower would be a concern. As with the Yard Area, classification of the soils as a RCRA dioxin-listed hazardous waste could preclude off-site disposal. Such a classification would require incineration as a pretreatment, and a commercial incinerator may not be available or economically feasible.

6.2.3 Cost

The costs for the capping, stabilization, and bioventing are in the same order of magnitude. Capping (\$244,000) is incrementally less expensive than bioventing and stabilization (\$382,000 and \$360,000, respectively). The costs increase sharply for the next three alternatives. Excavation of the first 4 feet of soil costs \$1.16 million, compared to \$2.69 million for excavation of all fill material and \$4.56 million for incineration.

6.3 STORAGE TANK AREA

6.3.1 Effectiveness

All four alternatives (excavation, incineration, stabilization, and capping) would effectively prevent human/ecological exposure to site contaminants. Capping would provide the least protection of groundwater. The water table is very high in this area, and, even if the area were capped, the water table could potentially rise into the contaminated soil. The excavation and stabilization options both address the first four feet of soil and would therefore be marginally more effective. This difference is not as pronounced as in the Furnace Courtyard Area because the VOCs, which are generally more soluble than the other contaminants, are not as elevated.

As with the Yard Area, the excavation alternative would present the highest potential for contaminant migration, and stabilization would also result in disturbance of the soil, but to a lesser degree. Engineering controls would be required to minimize contaminant migration for both of these alternatives. Capping should not require soil disturbance, assuming utilities, if present, could be abandoned in place and fill material were used to provide positive drainage. Incineration is the only alternative that would destroy the organic contaminants, but it would not affect the inorganics.

6.3.2 Implementability

All four alternatives are readily implementable. The stabilization alternative would require an air emissions permit. A hazardous waste determination would be required for the soil for the excavation alternative. As with the Yard Area, classification of the soils as a RCRA hazardous waste could preclude off-site disposal. Such a classification would require incineration as a pretreatment, and a commercial incinerator may not be available or economically feasible.

6.3.3 Cost

The Storage Tank Area is roughly equal in size to the Furnace Courtyard Area, and the costs of the four alternatives are similar. Estimated costs for excavation, incineration, stabilization, and capping are \$1.21 million, \$4.78 million, \$316,000, and \$212,000, respectively.

SECTION 7

REFERENCES

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